3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes the affected environment (existing conditions) and analyzes the environmental consequences (potential direct and indirect impacts) on various resources in the general analysis area resulting from the Proposed Action and alternatives. The Proposed Action and alternatives (including the No Action Alternative) are described in chapter 2.

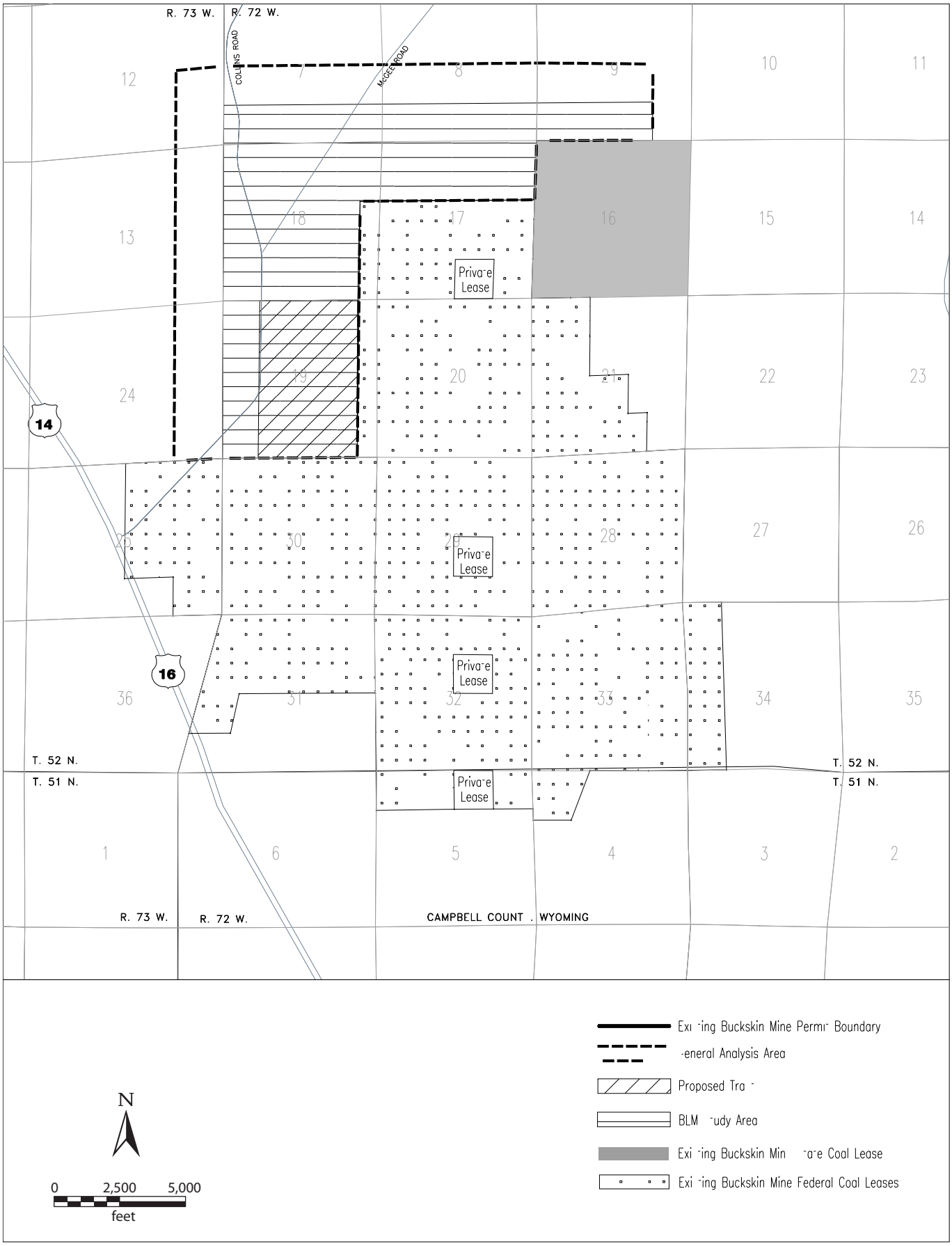
The general analysis area encompasses the BLM[1] study area and a 0.25-mile-wide buffer to the north and west (map 3.0-1), a total of approximately 2,847.3 acres. This area represents the maximum surface area that could be disturbed by mining activities analyzed in this EIS. Surface disturbance occurs outside of a coal lease area as a result of activities including, but not limited to, overstripping, highwall back-sloping (including catch benches), highwall reduction after mining to match undisturbed topography, and construction of flood- and sediment-control structures. As described in section 2.2.1.1, the proposed tract encompasses approximately 419 acres and the BLM study area, which includes the proposed tract, encompasses approximately 1,883.1 acres.

In keeping with the purpose of an EIS, the analyses presented in this document are based primarily on existing information. The general analysis area is substantially similar to the adjacent existing Buckskin Mine permit area in its physical features and resources present. Detailed site-specific environmental data have previously been collected and environmental analyses prepared to secure the existing coal leases and necessary mining permits for Buckskin. Because data collection and analyses encompassed an area larger than the previous lease and permit boundaries, most results from those efforts also apply to the general analysis area.

3.0.1 Background

Impacts were identified in this EIS based on criteria set forth by the Council on Environmental Quality (40 CFR 1508.27) and the professional judgment of the specialists completing the analyses. Impacts can be beneficial or adverse, and can be a primary result (direct) of an action or a secondary result (indirect). They can be short-term (persisting during mining and reclamation and through the time the reclamation bond is released) or long-term and/or permanent (persisting beyond reclamation and the life of the mine, respectively). Impacts also vary in terms of significance. Impact significance may range from no impact or negligible impacts to high or substantial impacts. Impacts can also be significant during mining but reduced to insignificance following completion of reclamation.

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



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.0-1
General Analysis Area

3.0.2 Resources Analyzed in this EIS

Resources addressed in this chapter were identified during the scoping process or by an interdisciplinary team review as having the potential to be affected. The BLM requires that certain elements are analyzed when present in the affected environment. The following required elements are present in the general analysis area and are addressed in this EIS:

- air quality (section 3.4);
- water quality (section 3.5);
- wetlands/riparian zones (section 3.7);
- invasive non-native species (section 3.9);
- threatened and endangered species (sections 3.9 and 3.10);
- cultural resources (section 3.12);
- hazardous or solid wastes (section 3.16);
- Native American religious concerns (section 3.17); and
- environmental justice (section 3.17).

The following additional resources also are present in the general analysis area and are addressed in this EIS:

- topography and physiography (section 3.2);
- geology, mineral, and paleontological resources (section 3.3);
- other water resources (section 3.5);
- alluvial valley floors (section 3.6);
- soils (section 3.8);
- vegetation (section 3.9);
- wildlife (section 3.10);
- land use and recreation (section 3.11);
- visual resources (section 3.13);
- noise (section 3.14);
- transportation resources (section 3.15); and
- socioeconomics (section 3.17).

Five additional aspects considered in this chapter are:

- regulatory compliance;
- mitigation and monitoring;

- residual impacts;
- the relationship between local short-term uses of the human environment and the maintenance and enhancement of long-term productivity; and
- any irreversible and irretrievable commitments of resources that would be associated with the action alternatives (42 United States Code § 4332[C]).

The following elements, which are required by the BLM when present in the affected environment, are not present in the general analysis area and are, therefore, not addressed in this EIS:

- areas of critical environmental concern;
- prime or unique farmlands;
- floodplains;
- wild and scenic rivers; and
- wilderness.

Individual data reports have been prepared for most resources to provide additional detailed information on the affected environment for the proposed tract and general analysis area. Copies of those reports can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.

As discussed in chapter 2, regulatory compliance, mitigation, and monitoring required by federal and/or state law are considered to be part of the action alternatives and are described for each resource area.

3.0.3 Summary of Mine Disturbance Area and Impacts

Table 3.0-1 provides comparisons of leased and disturbance acreages under the Proposed Action and alternatives. As described in section 3.0, additional disturbance beyond the respective lease boundaries is associated with overstripping and other activities necessary to recover the coal. The numbers presented for Alternative 1 are based on the overlap between the general analysis area and the existing permit boundary (map 3.0-1). Under this alternative, impacts analyzed for this overlap area would result from surface disturbance associated with the recovery of federal coal reserves under existing adjacent leases. Table 1-3 provides a breakdown of the total disturbed and reclaimed acreages for the entire existing Buckskin Mine permit area through December 2008.

Table 3.0-1. Comparisons of Disturbance Acres[1] and Estimated Recoverable Coal Reserves under the Proposed Action and Alternatives in the General Analysis Area and at the Buckskin Mine

	Alternative 1[2] (No Action)	Proposed Action	Alternative 2
Additional Coal Lease Area (Acres)	0	419.0	1,883.1
Total Potential Coal Lease Area (Acres) for the Mine[3]	6,438.2	6,857.2	8,321.3
% Increase in Potential Coal Lease Area (Acres) for the Mine	0	6.51	29.2
Estimated Potential Additional Disturbance Area (Acres)[4]	0	1,009.0[5]	2,191.6[5]
Estimated Expected Additional Disturbance Area (Acres)[4]	0	478.0[6]	618.0[6]
Estimated Potential Total Mine Disturbance Area (Acres)[4]	8,011.5[5]	9,020.5[5]	10,203.1[5]
Estimated Expected Total Mine Disturbance Area (Acres)[4]	6,727.8[6]	7,205.8[6]	7,345.8[6]
% Increase in Estimated Expected Disturbance Area (Acres)	0	7.1	9.2
Estimated Additional Recoverable Coal (million tons)[7]	0	54.1[6]	149.7[6]
Estimated Recoverable Coal for Mine as of 12/31/08 (million tons)[7]	344.3[6]	398.4[6]	494.0[6]
% Increase in Estimated Recoverable Coal as of 12/31/08	0	15.7	43.5

[1] Acreages are rounded to the nearest tenth.

[2] Under any alternative, potential surface disturbance could occur in the overlap between the general analysis area and the Buckskin Mine permit area (656 acres, map 3.0-1) to access previously permitted adjacent coal reserves. Approximately 182 acres of the proposed tract and 436.5 acres of the BLM study area are within the overlap area.

[3] Includes federal and state coal leases held by the Buckskin Mine.

[4] Estimated additional mine disturbance area = coal lease to be mined + associated surface disturbance necessary to access and process coal reserves (e.g., mine facilities, access roads, haul roads, topsoil stripping, highwall reduction, stockpiles).

[5] Represents disturbance in the existing or anticipated permit area under each alternative, which would be the actual limit of potential surface disturbance.

[6] Estimated expected additional and total mine disturbance areas, and estimated recoverable coal figures exclude lands under public roads, in their rights-of-way or 100-foot-wide buffer zones, in the 300-foot-wide buffer zone around the occupied residence, or in the operationally limited lands west of the Collins and McGee roads. Exact boundaries are presently undetermined.

[7] Estimated recoverable coal resources = tons of mineable coal x recovery factor, and excludes all losses (spillage, spontaneous fires) that occur during normal mining operations. Recoverable coal figures assume all recoverable coal (except Canyon) has a recovery rate assumption of 90%. Canyon has a recovery rate assumption of 95%.

Table 3.0-2 presents a comparative summary of the direct and indirect environmental impacts under the Proposed Action and alternatives. Table 4-41 presents the same summary for the cumulative effects under each option. These impacts are analyzed in greater detail in chapter 3 and chapter 4, respectively.

Table 3.0-2. Summary Comparison of Magnitude[1] and Duration[2] of Direct and Indirect Impacts in the General Analysis Area under the Proposed Action and Alternatives[3]

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
3.2 TOPOGRAPHY AND PHYSIOGRAPHY			
Lower surface elevation	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres
Permanent topographic moderation, which could result in:			
▪ Microhabitat reduction	Minor to moderate, long-term	Minor to moderate, long-term on 478 acres; no impact on rough breaks	Minor to moderate, long-term on up to 2,847 acres
▪ Habitat diversity reduction	Minor to moderate, long-term	Minor to moderate, long-term on 478 acres	Minor to moderate, long-term on up to 2,847 acres
▪ Big game carrying capacity reduction	Minor, short-term	Minor, short-term on 478 acres	Minor, short-term on up to 2,847 acres
▪ Reduction in water runoff and peak flows	Moderate, beneficial, long-term	Minor to moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Increased precipitation infiltration	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Reduction in erosion	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Potential enhanced vegetative productivity	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Potential acceleration of groundwater recharge	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
3.3 GEOLOGY AND MINERALS			
Removal of coal	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres
Removal and replacement of topsoil and overburden	Moderate, permanent	Moderate, permanent on 478 acres	Moderate, permanent on up to 2,847 acres
Physical characteristic alterations in replaced overburden	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Loss of unrecovered CBNG through venting and/or depletion of hydrostatic pressure	No impact	Moderate to substantial, permanent on 419 acres	Moderate to substantial, permanent on up to 1,883 acres
Loss of access for development of sub-coal conventional oil and gas resources and other minerals/loss of resources	Minor, short-term on access; minor permanent on scoria resources; no impacts on uranium or bentonite	Moderate, short-term on access to 419 acres; minor, short-term on access to 59 surface acres; no impacts on scoria, uranium, or bentonite resources	Moderate, short-term on access to up to 1,883 acres; minor, short-term on access to up to 964 surface acres; minor, permanent on scoria resources; no impacts on uranium, or bentonite resources
Destruction of paleontological resources that are not exposed on the surface	Moderate to high, permanent	Moderate to high, permanent on 478 acres	Moderate to high, permanent on up to 2,847 acres
3.4 AIR QUALITY			
Particulate emissions:			
▪ Elevated concentrations associated with projected average production rate of 25 mmt per year in compliance with ambient standards	Moderate, adverse short-term for current life-of-mine estimate (14 years); no projected increase or exceedances	Moderate, adverse short-term for 2 years beyond current life-of-mine estimate; no projected increase in currently approved mining operations; no projected exceedances	Moderate, adverse short-term for up to 6 years beyond current life-of-mine estimate; no projected increase in currently approved mining operations; no projected exceedances
▪ Potential for public exposure to particulate emissions along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	Minor, short-term for most residences for current life-of-mine estimate (14 years); highway and county roads average 0.5 mile away; moderate for one occupied residence within 0.5 mile; high for one occupied residence within 0.25 mile	Minor, short-term for most residences for 2 years beyond current life-of-mine estimate; highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; nearest occupied home > 0.5 mile away	Minor to moderate, short-term for most residences for up to 6 years beyond current life-of-mine estimate; highway is ≥0.5 mile away; two county roads pass through area; moderate for one occupied residence within 0.25 mile; high for one occupied residence within general analysis area
▪ Potential for human health impacts as a result of exposure to particulate emissions	Minor, short-term for current life-of-mine estimate (14 years); no projected increase or exceedances	Low to minor, short-term for 2 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations	Minor to moderate, short-term for up to 6 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations;
NO_x emissions from machinery:			
▪ Elevated concentrations associated with average production of 25 mmt per year in compliance with ambient standards	Minor to moderate, adverse short-term for current life-of-mine estimate (14 years); no NO_x point sources at Buckskin; no projected increase or exceedances	Minor to moderate, adverse short-term for 2 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no projected increase in currently approved mining operations, no projected exceedances	Minor to moderate,adverse short-term for up to 6 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no projected increase in currently approved mining operations, no projected exceedances

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
▪ Potential for public exposure along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	Minor to high, short-term for most residences for current life-of-mine estimate (14 years); no NO_x point sources at Buckskin; highway and county roads average 0.5 mile away; moderate, short-term for one occupied residence within 0.5 mile; high, short-term for one occupied residence within 0.25 mile	Minor to moderate, short-term for most residences for 2 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no projected increase in currently approved mining operations, no projected exceedances; highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; nearest occupied home > 0.5 mile away	Minor to high, short-term for most residences for up to 6 years beyond current life-of-mine estimate; No NO_x point sources at Buckskin; no projected increase in currently approved mining operations, no projected exceedances; highway is ≥0.5 mile away; two county roads pass through area; moderate for one occupied residence within 0.25 mile; high for one occupied residence within general analysis area
▪ Potential for human health impacts as a result of exposure	Minor, short-term for current life-of-mine estimate (14 years); no NO_x point sources at Buckskin; no projected increase or exceedances	Minor, short-term for 2 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations	Minor to moderate, short-term for up to 6 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no projected increase or exceedances in currently approved mining operations
NO_x emissions from blasting (in compliance with Buckskin Mine permit blasting conditions):			
▪ Elevated concentrations associated with average production of 25 mmt per year in compliance with ambient standards	No impact	Low, short-term for 2 years beyond current life-of-mine estimate; no reported events; no projected increase in currently approved mining operations or projected exceedances	Low, short-term for up to 6 years beyond current life-of-mine estimate; no reported events; no projected increase in currently approved mining operations or projected exceedances
▪ Potential for public exposure along U.S. Highway 14-16, various county roads, and occupied dwellings in the area	No impact	Low, short-term for 2 years beyond current life-of-mine estimate; no reported or projected events; highway is ≥1 mile away; county road adjacent for 0.6 mile stretch; nearest occupied home > 0.5 mile away	Low, short-term for up to 6 years beyond current life-of-mine estimate; no reported or projected events; highway is ≥0.5 mile away; two county roads pass through area; minor for one occupied residence within 0.25 mile and one within general analysis area
▪ Potential for human health impacts as a result of exposure	No impact	Low, short-term for 2 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations	Low to minor, short-term for up to 6 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Visibility:			
▪ Elevated concentrations of fine particulate matter associated with average production rate of 25 mmt per year	Low, short-term for current life-of-mine estimate (14 years); no projected increase or exceedances; no changes in current VRM class; no visual resources unique to area present	Low, short-term for 2 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations; no projected changes in current VRM class; no visual resources unique to area present	Low, short-term for up to 6 years beyond current life-of-mine estimate; no projected increase or exceedances in currently approved mining operations; no projected changes in current VRM class; no visual resources unique to area present
Acidification of lakes:			
▪ NO_2 emissions from mining coal at Buckskin	Very low, short-term for current life-of-mine estimate (14 years); no NO_x point sources at Buckskin; no sensitive lakes in vicinity	Very low, short-term for 2 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no sensitive lakes in vicinity	Very low for up to 6 years beyond current life-of-mine estimate; no NO_x point sources at Buckskin; no sensitive lakes in vicinity
▪ SO_2 emissions derived from burning Buckskin Mine coal to produce power	Moderate, short term for current life-of-mine estimate (14 years) in vicinity of power plants; no sensitive lakes in vicinity	Moderate, short term in vicinity of power plants for 2 years beyond current life-of-mine estimate; No sensitive lakes in vicinity	Moderate, short term in vicinity of power plants for up to 6 years beyond current life-of-mine estimate; No sensitive lakes in vicinity
3.5 WATER RESOURCES			
Groundwater:			
▪ Removal of coal and overburden aquifers	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres
▪ Replacement of existing coal and overburden with unconsolidated backfill material	No impact	Moderate, permanent on 419 acres	Moderate, permanent on up to 1,883 acres
▪ Depressed water levels in overburden and coal aquifers adjacent to mine	No impact	Moderate, short- to long-term for 2 years beyond current life-of-mine estimate	Moderate, short- to long-term for up to 6 years beyond current life-of-mine estimate
▪ Change in hydraulic properties in backfilled areas	No impact	Low, long-term to permanent for 2 years beyond current life-of-mine estimate	Low, long-term to permanent for up to 6 years beyond current life-of-mine estimate
▪ Increase in total dissolved solids concentrations in backfilled areas	No impact	Moderate, long-term for 2 years beyond current life-of-mine estimate	Moderate, long-term for up to 6 years beyond current life-of-mine estimate
▪ Use of subcoal aquifers for water supply	No impact	Negligible, short-term for 2 years beyond current life-of-mine estimate	Negligible, short-term for up to 6 years beyond current life-of-mine estimate
▪ Decrease in water supply for groundwater-right holders within the 5-foot drawdown area	No impact	Moderate, permanent	Moderate, permanent

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Surface water:			
▪ Diversion and disruption of surface drainage systems	Significant temporary; moderate, short-term for current life-of-mine estimate (14 years)	Significant temporary on 478 acres; moderate, short-term on surface drainage for 2 years beyond current life-of-mine estimate; no channel diversions	Significant temporary on up to 2,847 acres; moderate, short-term on surface drainage for up to 6 years beyond current life-of-mine estimate; no channel diversions expected
▪ Reconstruction of surface drainage systems	Permanent	Permanent on 478 acres	Permanent on up to 2,847 acres
▪ Increased runoff and erosion rates on disturbed lands due to vegetation removal	Significant, temporary; minor to moderate short-term due to use of flood- and erosion-control structures and reseeding	Significant, temporary on 478 acres; minor to moderate short-term due to use of flood- and erosion-control structures and reseeding	Significant, temporary on up to 2,847 acres; minor to moderate, short-term due to use of flood- and erosion-control structures and reseeding
▪ Increased infiltration on reclaimed lands due to topographic moderation	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Increased runoff on reclaimed lands due to loss of soil structure	Moderate, long-term	Moderate, long-term on 478 acres	Moderate, long-term on up to 2,847 acres
▪ Potential for adverse downstream effects as a result of sediment produced by large storms	Moderate, long-term	Minor, long-term on 478 acres; no connected drainages	Moderate, long-term on up to 2,847 acres
Water rights:			
▪ Disruption of water supply for water-rights holders with wells completed in the coal or overburden aquifer within the 5-foot drawdown area or with surface water rights within the disturbance area	Moderate, adverse long-term for wells until recharge/moderate, adverse long-term for current life-of-mine estimate (14 years); up to two surface water rights	Moderate, adverse long-term for wells until recharge/minor, adverse long-term for one surface water right; no connected drainages; impacts for 2 years beyond current life-of-mine estimate	Moderate, adverse long-term for wells until recharge/moderate, adverse long-term for up to two surface water rights and up to 6 years beyond current life-of-mine estimate , no new creek diversions
3.6 ALLUVIAL VALLEY FLOORS			
Removal and restoration of AVFs	No impact	No impact	No impact
Disruptions to streamflows supplying downstream AVFs	No impact; stream diversions constructed for existing approved mining operations maintain streamflow	No impact; closed drainage prevents streamflow	No impact; stream diversions constructed to maintain streamflow

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
3.7 WETLANDS			
Removal of jurisdictional wetlands and loss of wetland function until reclamation occurs	Moderate, short-term for current life-of-mine estimate (14 years); 2 potential jurisdictional wetlands	Minor, short-term on 478 acres for 2 years beyond current life-of-mine estimate; 2 potential jurisdictional wetlands, total of 0.48 acre; no net loss	Moderate, short-term on up to 2,847 acres for up to 6 years beyond current life-of-mine estimate; up to 12 potential jurisdictional wetlands, total of 30.7 acres; no net loss
Removal of nonjurisdictional wetlands	Moderate, short- to long-term; 1 nonjurisdictional wetland	No impact	Moderate, short- to long-term on up to 2,847 acres; 6 nonjurisdictional wetlands
3.8 SOILS			
Changes in physical properties after reclamation would include:			
▪ Increased near surface bulk density and decreased soil infiltration rate resulting in increased potential for soil erosion	Moderate, long-term	Moderate, long-term on 478 acres	Moderate, long-term on up to 2,847 acres
▪ More uniformity in soil type, thickness, and texture	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
▪ Decreased runoff due to topographic modification	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres
Changes in biological properties in soils that are stockpiled before reclamation would include:			
▪ Reduction in organic matter	Moderate, short- to long-term	Moderate, long-term on 478 acres	Moderate, long-term on up to 2,847 acres
▪ Reduction in microorganism population	Moderate, short- to long-term	Moderate, long-term on 478 acres	Moderate, long-term on up to 2,847 acres
▪ Reduction in seeds, bulbs, rhizomes, and live plant parts	Moderate, short- to long-term	Moderate, long-term on 478 acres	Moderate, long-term on up to 2,847 acres
Changes in chemical properties would include:			
▪ More uniform soil nutrient distribution	Moderate, beneficial, long-term	Moderate, beneficial, long-term on 478 acres	Moderate, beneficial, long-term on up to 2,847 acres

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
3.9 VEGETATION			
During mining:			
▪ Progressive removal of existing vegetation	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
▪ Increased erosion	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
▪ Wildlife habitat and livestock grazing loss	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
After revegetation:			
▪ Changes in vegetation patterns	Negligible, long-term	Negligible, long-term on 478 acres	Negligible, long-term on up to 2,847 acres
▪ Reduction in vegetation diversity	Negligible, long-term	Negligible, long-term on 478 acres	Negligible, long-term on up to 2,847 acres
▪ Reduction in shrub density	Minor, long-term; shrubs less than 11% composition	Minor, long-term on 478 acres; shrubs less than 11% composition	Minor, long-term on up to 2,847 acres; shrubs less than 11% composition
▪ Decreased big game habitat carrying capacity	Low, long-term	Low, long-term on 478 acres	Low, long-term on up to 2,847 acres
▪ Decreased habitat for shrub dependent species	Minor, long-term; shrubs less than 11% composition	Minor, long-term on 478 acres; shrubs less than 11% composition	Minor, long-term on up to 2,847 acres; shrubs less than 11% composition
▪ Potential invasion of non-native plant species	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
3.10 WILDLIFE			
Big game displacement from active mining areas	Moderate, short-term	Moderate, short-term on 478 acres for 2 years beyond current life-of-mine estimate	Moderate, short-term on up to 2,847 acres for up to 6 years beyond current life-of-mine estimate
Increased competition on adjacent undisturbed or reclaimed lands, especially big game	Moderate, short-term for current life-of-mine estimate (14 years)	Moderate, short-term for 2 years beyond current life-of-mine estimate	Moderate, short-term for up to 6 years beyond current life-of-mine estimate
Restriction of wildlife movement, especially big game	Moderate, short-term for current life-of-mine estimate (14 years)	Moderate, short-term on 478 acres for 2 years beyond current life-of-mine estimate	Moderate, short-term on up to 2,847 acres for up to 6 years beyond current life-of-mine estimate

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Increased mortality of small mammals	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
Displacement of small and medium-sized mammals	Moderate, short-term for current life-of-mine estimate (14 years)	Moderate, short-term on 478 acres for 2 years beyond current life-of-mine estimate	Moderate, short-term on up to 2,847 acres for up to 6 years beyond current life-of-mine estimate
Surface and noise disturbance of occupied sage-grouse leks	No surface impact, minor noise impact, short-term for current life-of-mine estimate (14 years); 1 sage-grouse lek within 0.5 mile; last active in 2001, confirmed inactive in 13 of last 14 years	No impact; no sage-grouse leks on or within1.5 mile	No surface impact, minor noise impact, short-term for up to 6 years beyond current life-of-mine estimate; 1 sage-grouse lek within 0.5 mile; last active in 2001, confirmed inactive in 13 of last 14 years
Disturbance of potential sage-grouse nesting habitat during mining	Minor, short-term; shrubs less than 11% composition	Minor, short-term on 478 acres; shrubs less than 11% composition	Minor, short-term on up to 2,847 acres; shrubs less than 11% composition
Loss of sage-grouse nesting habitat after reclamation	Minor, long-term; long shrub restoration process	Minor, long-term on 478 acres; long shrub restoration process	Minor, long-term on up to 2,847 acres; long shrub restoration process
Alteration of plant and animal communities after reclamation	Negligible, short-term	Negligible, short-term on 478 acres	Negligible, short-term on up to 2,847 acres
Abandonment of raptor nests	Low, short-term; 1 intact nest present; nest trees scheduled for eventual disturbance; USFWS approved mitigation plan in place to protect active nests; pair documented as acclimated to disturbance	Low, short-term; 1 intact nest present; nest trees scheduled for eventual disturbance under No Action Alternative; USFWS approved mitigation plan will be updated to protect active nests; pair documented as acclimated to disturbance	Low, short-term; 3 intact nests present; nest trees at one site scheduled for eventual disturbance, other two sites in residential shelterbelts not scheduled for disturbance; USFWS approved mitigation plan will be updated to protect active nests; pairs documented as acclimated to disturbance
Loss of foraging habitat for raptors	Negligible, short-term	Negligible, short-term on 478 acres	Negligible, short-term on up to 2,847 acres
Loss of nesting, roosting, and foraging habitat for Migratory Bird Species of Management Concern (including the bald eagle)	Negligible, short-term	Negligible, short-term on 478 acres	Negligible, short-term on up to 2,847 acres
Reduction in waterfowl nesting and feeding habitat	Negligible, short-term; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on 478 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on up to 2,847 acres; few water bodies present, ephemeral or limited seasonal presence

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Loss of habitat for aquatic species during mining	Negligible, short-term; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on 478 acres; few water bodies present, ephemeral or limited seasonal presence	Negligible, short-term on up to 2,847 acres; few water bodies present, ephemeral or limited seasonal presence
Road kills by mine-related traffic	Minor, short-term	Minor, short-term on 478 acres	Minor, short-term on up to 2,847 acres
Reduction in habitat carrying capacity and habitat diversity on reclaimed lands	Minor, short-term	Minor, short-term on 478 acres	Minor, short-term on up to 2,847 acres
Potential reduction in microhabitats on reclaimed lands	Minor to moderate, long-term	Minor to moderate, long-term on 478 acres	Minor to moderate, long-term on up to 2,847 acres
Threatened, Endangered, Proposed, And Candidate Species (Appendix I)			
Black-footed ferret	No effect	No effect	No effect
Blowout penstemon	No effect	No effect	No effect
Ute ladies'-tresses	No effect	No effect	No effect
3.11 Land Use and Recreation			
Reduction of livestock grazing	Minor, short-term	Minor, short-term on 478 acres	Minor, short-term on up to 2,847 acres
Loss of wildlife habitat	Minor to moderate, short-term	Minor to moderate, short-term on 478 acres	Minor to moderate, short-term on up to 2,847 acres
Loss of access for sub-coal oil and gas development	Minor, short-term for access	Moderate, short-term for access on 419 acres; minor, short-term for access on 59 surface acres	Moderate, short-term for access on up to 1,883 acres; minor, short-term for access on up to 964 surface acres
Removal of oil and gas production facilities	Moderate, short-term; no conventional oil and gas production	Moderate, short-term on 478 acres; no conventional oil and gas production	Moderate, short-term for access on up to 2,847 acres; no conventional oil and gas production
Loss of access to public land available for recreation and grazing	No impact; entirely private	No impact; entirely private surface	No impact; entirely private surface

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
3.12 CULTURAL RESOURCES AND NATIVE AMERICAN CONSULTATION			
Cultural Resources			
▪ Sites that are not eligible for NRHP	Ineligible sites in existing approved mining operations may be destroyed without protection or further work	Ineligible sites on 478 acres may be destroyed without protection or further work	Ineligible sites on up to 2,847 acres may be destroyed without protection or further work
▪ Sites that are eligible for NRHP	No known sites; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No known sites on 478 acres; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No known sites on entire 2,847 acres; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining
▪ Sites that are unevaluated for NRHP eligibility	No known unevaluated sites; impacts on unevaluated sites are not permitted; unevaluated sites would be evaluated prior to mining	No known unevaluated sites on 478 acres; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining	No known unevaluated sites on entire 2,847 acres; impacts on eligible sites discovered during operations would be avoided or mitigated through data recovery prior to mining
Native American Heritage Sites	No impact identified	No impact identified on 478 acres	No impact identified on entire 2,847 acres
3.13 VISUAL RESOURCES			
During mining:			
▪ Alteration of landscape by mining facilities and operations	Moderate, short-term	Moderate, short-term on 478 acres	Moderate, short-term on up to 2,847 acres
▪ Visibility of mining operations from highway	Moderate, short-term for current life-of-mine estimate (14 years); highway is 0.5 to 2.5 miles away	Low, short-term for 2 years beyond current life-of-mine estimate; highway is ≥1 mile away	Moderate, short-term for up to 6 years beyond current life-of-mine estimate; highway 0.5 to 1.5 miles away
Following reclamation:			
▪ Smoother sloped terrain	Minor to moderate, permanent	Minor, permanent on 478 acres; no rough breaks	Minor to moderate, permanent on up to 2,847 acres
▪ Reduction in sagebrush density	Minor, long-term; shrubs less than 11% composition	Minor, long-term on 478 acres; shrubs less than 11% composition	Minor, long-term on up to 2,847 acres; shrubs less than 11% composition

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
3.14 NOISE			
Increased noise levels	No impact to high, short-term for current life-of-mine estimate (14 years); one occupied residence within 0.25 mile, most homes ≥1 mile away on far side of active roads or hills for audio buffer	No impact to moderate, short-term for 2 years beyond current life-of-mine estimate; 0.75 mile to nearest occupied residence; most homes on far side of active roads or hills for audio buffer	No impact to moderate, short-term for up to 6 years beyond current life-of-mine estimate; 1 mile to nearest occupied residence; most homes on far side of active roads or hills for audio buffer
3.15 TRANSPORTATION FACILITIES			
Use of railroads to ship coal	Moderate, short-term for current life-of-mine estimate (14 years)	Moderate, short-term for 2 years beyond current life-of-mine estimate	Moderate, short-term for up to 6 years beyond current life-of-mine estimate
Employee and service contractor use of highways to and from mine sites	Moderate, short-term for current life-of-mine estimate (14 years)	Moderate, short-term for 2 years beyond current life-of-mine estimate	Moderate, short-term for up to 6 years beyond current life-of-mine estimate
Relocation of pipelines	No impact; all lines already addressed for current life-of-mine estimate (14 years)	Moderate, short-term for 2 years beyond currently life-of-mine estimate; 3 pipelines affected	Moderate, short-term for up to 6 years beyond currently life-of-mine estimate; 5 pipelines affected
Relocation of utility lines	Negligible, short-term; all or most lines already addressed for current life-of-mine estimate (14 years)	Low, short-term for 2 years beyond currently life-of-mine estimate; 2 overhead power lines affected, both within existing permit area	Minor, short-term for up to 6 years beyond currently life-of-mine estimate; 8 overhead power lines affected, 7 in existing permit area
Mining operations near the Collins and McGee roads	Minor, short-term for current life-of-mine estimate (14 years); no roads expected to be closed or relocated	Moderate, short-term for 2 years beyond currently life-of-mine estimate; 0.6 mile along 1 county road; no roads expected to be closed or relocated	Moderate, short-term for up to 6 years beyond currently life-of-mine estimate; approximately 3 miles along 2 county roads; no roads expected to be closed or relocated
3.16 HAZARDOUS AND SOLID WASTE			
Waste generated by mining operations	Negligible, short-term for current life-of-mine estimate (14 years)	Negligible, short-term for 2 years beyond current life-of-mine estimate	Negligible, short-term for up to 6 years beyond current life-of-mine estimate
3.17 SOCIOECONOMICS			
Employment	Negligible, beneficial, short-term for current life-of-mine estimate (14 years); no new hires expected	Negligible, beneficial, short-term for 2 years beyond current life-of-mine estimate; no new hires expected	Negligible, beneficial, short-term for up to 6 years beyond current life-of-mine estimate; no new hires expected

Description of Potential Impact by Resource	Magnitude and Duration of Impact		
	No Action Alternative[4]	Action Alternatives[5]	
	Alternative 1	Proposed Action	Alternative 2
Revenues from royalties and taxes to the state and local government	Substantial, beneficial short-term for current life-of-mine estimate (14 years)	Substantial, beneficial, short-term for 2 years beyond current life-of-mine estimate	Substantial, beneficial, short-term for up to 6 years beyond current life-of-mine estimate
Revenues from royalties and taxes to the federal government	Substantial, beneficial short-term for current life-of-mine estimate (14 years)	Substantial, beneficial, short-term for 2 years beyond current life-of-mine estimate	Substantial, beneficial, short-term for up to 6 years beyond current life-of-mine estimate
Economic development	Moderate, beneficial short-term for current life-of-mine estimate (14 years)	Moderate, beneficial, short-term for 2 years beyond current life-of-mine estimate	Moderate, beneficial, short-term for up to 6 years beyond current life-of-mine estimate
Additional housing and infrastructure needs	No new impact for current life-of-mine estimate (14 years)	No new impact for 2 years beyond current life-of-mine estimate	No new impact for up to 6 years beyond current life-of-mine estimate

mmt = million tons; NO_x = oxides of nitrogen; WDEQ/AQD = Wyoming Department of Environmental Quality/Air Quality Division; WDEQ/LQD = Wyoming Department of Environmental Quality/Land Quality Division; VRM = visual resource management; SO_2 = sulfur dioxide; AVF = alluvial valley floor; NRHP = National Register of Historic Places

1 Refer to sections 3.2 through 3.17 for discussions on magnitude of impacts for each resource under each alternative.

2 Short-term impacts persist during mining and reclamation and through the time the reclamation bond is released; long-term and/or permanent impacts persist beyond reclamation and the life of the mine, respectively.

3 All impacts are assumed adverse unless noted otherwise.

4 Impacts under the No Action Alternative apply to the overlap area between the general analysis area and the existing Buckskin Mine permit area. These impacts would be limited to surface disturbance associated with mine support (e.g., topsoil stripping) and reclamation activities (described in section 1.1.3.3 and section 1.1.3.4, respectively) for currently permitted mining in existing coal leases. These impacts would occur under the action alternatives, as well.

5 Kiewit estimates that actual physical disturbance from mining and mine support and reclamation activities would be 478 acres under the Proposed Action and 618 acres under Alternative 2. Those estimates assume that no roads would be closed or relocated and that surface disturbance would not encroach on the occupied residence and its 300-foot buffer. Mine support and reclamation activities (described in section 1.1.3.3 and section 1.1.3.4, respectively) would occur in a buffer area to the north of the proposed tract (under the Proposed Action) or 0.25-mile-wide buffer around the final tract configuration (under Alternative 2). The maximum potential disturbance area under Alternative 2, if Kiewit were to pursue road closures/relocations or surface rights for the occupied residence, would be approximately 2,847 acres. This area of maximum potential disturbance was analyzed in this EIS, and is referred to throughout as the general analysis area.

3.1 General Setting

This section provides an overview of the physical setting and climatic characteristics of the general analysis area and surrounding region.

3.1.1 General Location and Characteristics

The general analysis area is adjacent to one of the northern-most operating mines in the PRB, in the part of the Northern Great Plains that includes most of northeastern Wyoming. This region is also within the Great Plains Steppe and Shrub Province of the Dry Domain ecoregion of the continent (USDA Forest Service 2009). Ecoregions are comprised of large areas of similar climate where ecosystems are present in predictable patterns. The defining characteristic of a dry climate is that annual losses of water through evaporation at the earth's surface exceed annual water gains from precipitation. As a result of that overall water deficiency, no permanent streams originate in dry climate zones. The Dry Domain ecoregion is the most extensive in the world, and occupies one-quarter or more of the earth's land surface.

Wyoming has a relatively cool climate due to its elevation. Away from the mountains, the mean maximum temperatures in July range between 85 and 95° F and the mean minimum temperatures that month range from 50 to 60 ° F (National Oceanic and Atmospheric Administration 1985.). January is typically the coldest month, with minimum temperatures often ranging from 5 to 10°F. Early freezes in the fall and late in the spring are characteristic of the state, and result in long winters and short (average 125 days) growing seasons. Sunshine dominates the area, with approximately 60% of winter days and about 75% of summer days. Spring and summer are the wettest months, though rainfall amounts are highly variable and can be somewhat localized. Relative humidity ranges from 5 to 75%, depending on the season, with an average of 25 to 30% on the warmer summer days. Wyoming is quite windy, with frequent periods of wind speeds of 30 to 40 miles per hour in winter. Snow typically falls from November through May, with light to moderate levels at lower elevations. The low relative humidity, high percentage of sunshine, and higher average winds all contribute to a high rate of evaporation across the state.

The vegetation in the general analysis area consists of species common to eastern Wyoming and is consistent with vegetative communities in the adjacent Buckskin Mine permit area. The proposed tract is dominated (approximately 71%) by various upland grasslands. The general analysis area is comprised primarily of upland grasslands (approximately 40%) and agricultural lands (croplands and pastures, 31%). Section 3.9 provides a detailed discussion on vegetation resources.

3.1.2 Climate and Meteorology in the General Analysis Area

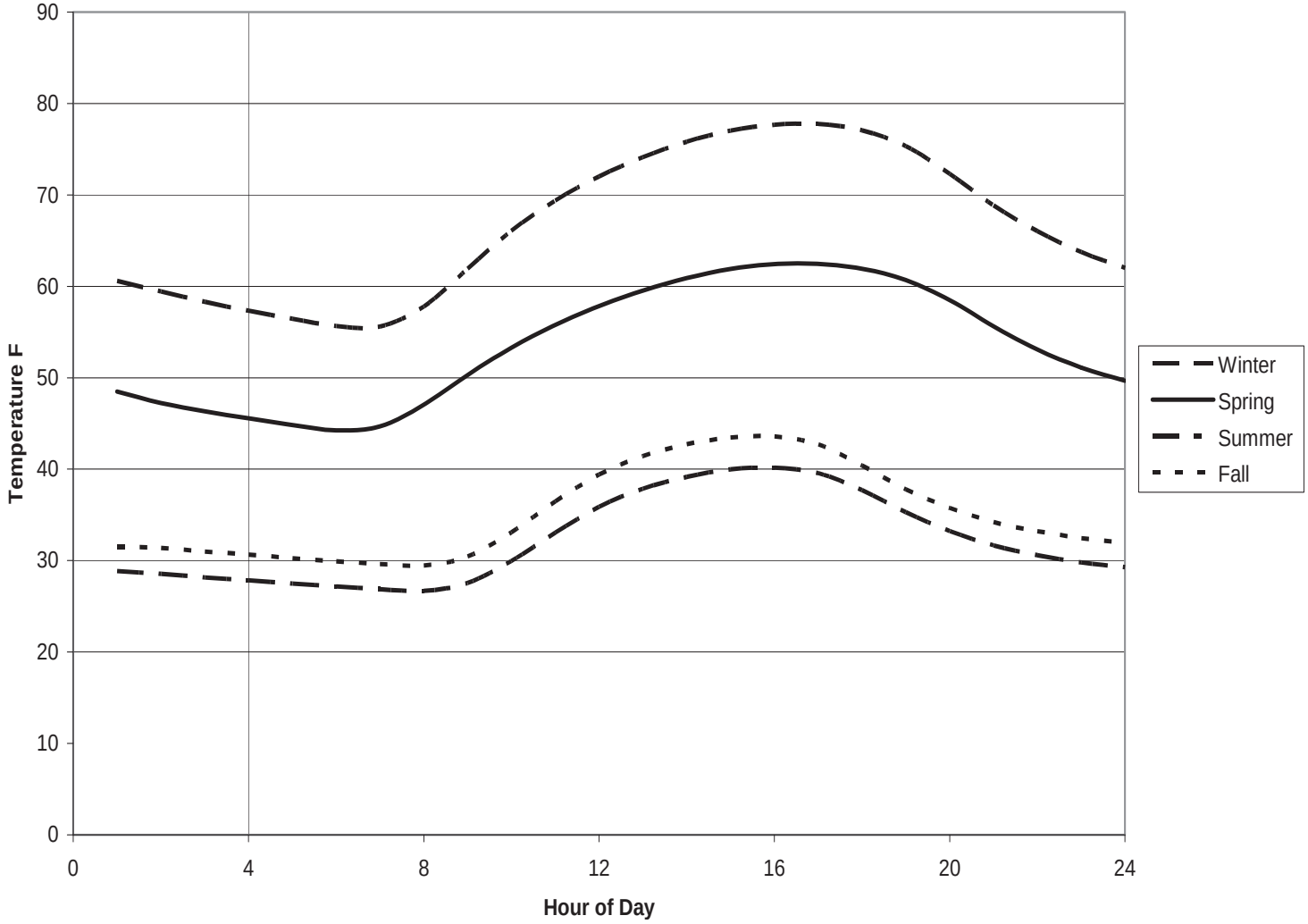
As indicated, the climate in the general analysis area is typical of a semi-arid, high plains environment with relatively large seasonal and diurnal variations in temperature (figure 3.1-1). Summers are relatively short and warm, while winters are longer and cold. The average daily

mean temperature at the adjacent Buckskin Mine meteorological station from 1986 through 2007 was 46º Fahrenheit (F). The highest recorded temperature at the mine during that period was 106º F and the lowest was minus 33º F. July is the warmest month, with a mean daily temperature of 72º F, and January is the coldest month, with a mean daily temperature of 26º F. The frost-free period for this area lasts between 100 and 130 days (Curtis 2004).

Precipitation occurs predominantly during the spring and fall, with approximately 10% in the form of snow. The average annual precipitation measured at the National Oceanic and Atmospheric Administration meteorological station (Gillette 9ESE) located about 14 miles southeast of the Buckskin Mine was 15.67 inches (Western Regional Climate Center 2008). May (2.67 inches) and June (2.69 inches) are the wettest, while January (0.57 inch) and February (0.56 inch) are the driest. Snowfall averages 56.4 inches per year at the Gillette 9ESE station, with the highest monthly averages occurring in March (10.4 inches) and April (8.4 inches). In keeping with the Dry Domain ecoregion, evapo-transpiration, at approximately 31 inches of water per year, exceeds annual precipitation (National Oceanic and Atmospheric Administration 1969).

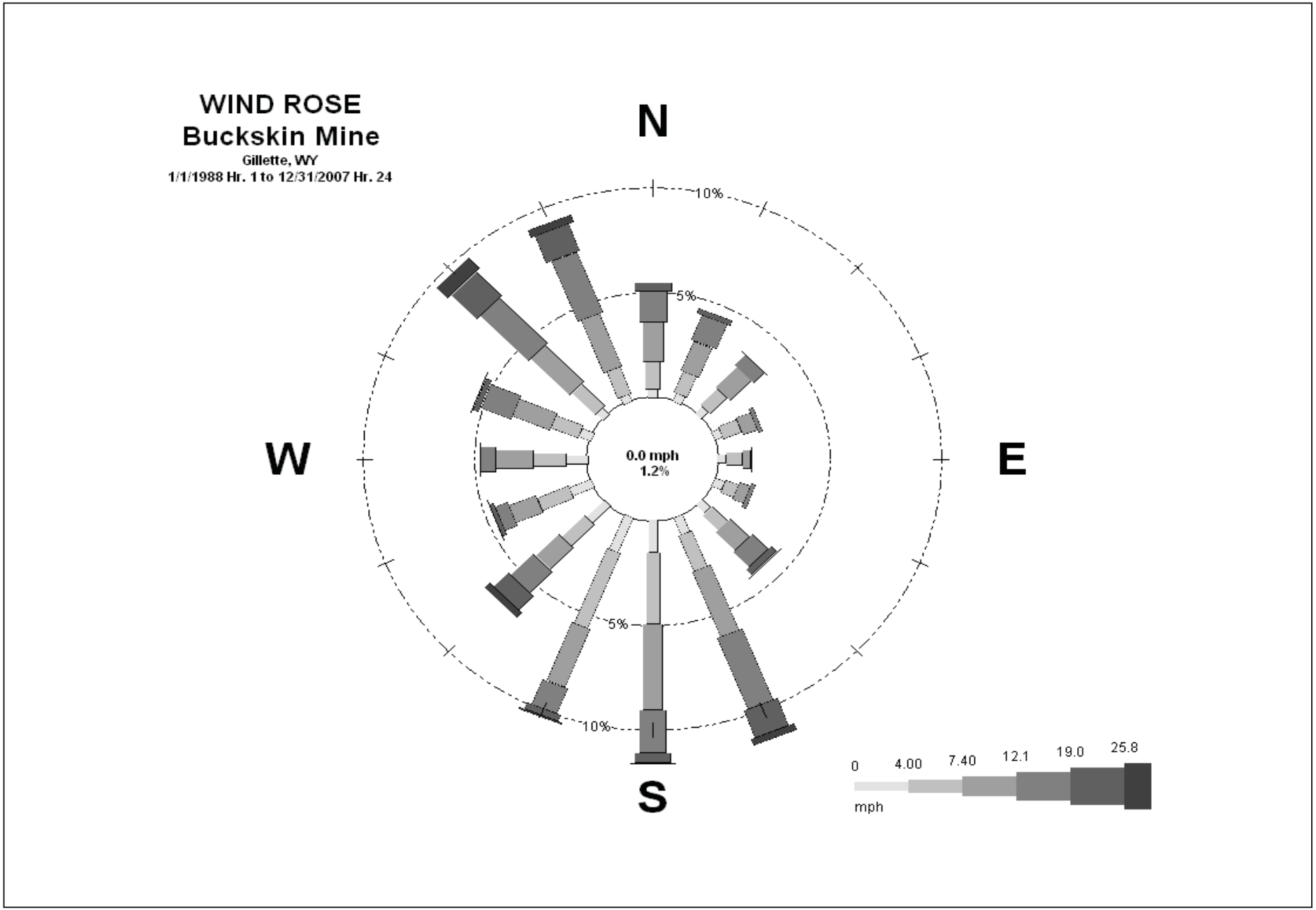
Surface wind speeds at the Buckskin Mine meteorological station average 10.5 miles per hour throughout the year. Prevailing winds are from the north-northwest and south-southeast directions (figure 3.1-2), depending on the season. The area experiences extreme wind gusts, especially during thunderstorm activity in June, July, and August. Distinct diurnal changes occur, with average wind velocities increasing during the day due to solar insolation, and decreasing during the night (figure 3.1-3). Local variations in wind speed and direction are primarily due to differences in topography. Wind speeds at the mine's meteorological station are highest in the winter and spring. From May through September, winds are calmer and directions are more random, although winds from the north or southeast still occur slightly more often than from other directions.

During periods of strong wind, dust may affect air quality across the region. Air quality can also be affected when air is trapped by poor ventilation due to persistent light or calm winds, and by the presence of inversions. Such episodes are referred to as air stagnation events (Wang and Angell 1999). An average of 15 air-stagnation events occurs annually in the PRB with an average duration of two days each (BLM 1974).



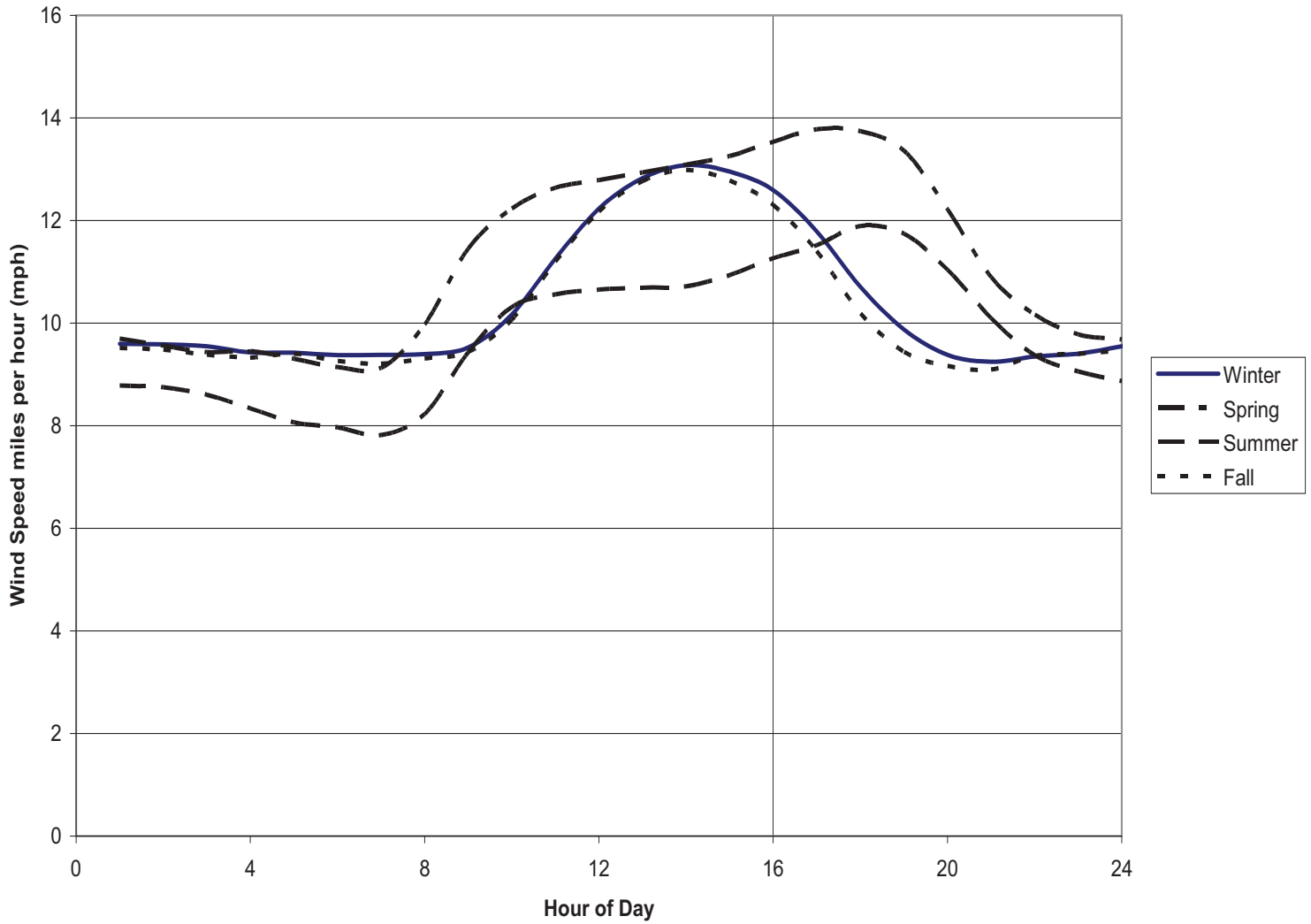
No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.1-1
Average Diurnal Temperature by Season at Buckskin Mine



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.1-2
Wind Rose for the Buckskin Mine



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.1-3
Average Diurnal Wind Speed by Season at the Buckskin Mine

3.2 Topography

This section describes the affected environment as it relates to topography in the general analysis area, and identifies potential impacts on topography that would result from the Proposed Action and alternatives.

3.2.1 Affected Environment

The northern portion of the PRB is a high plains area within the unglaciated Missouri Plateau subregion of the Great Plains Province in northeast Wyoming. The PRB is both a topographic drainage and geologic structural basin. The structural basin is an elongated, asymmetrical syncline approximately 120 miles east to west and 200 miles north to south. It is bounded in Wyoming by the Black Hills on the east; the Big Horn Mountains on the west; and the Hartville Uplift, Casper Arch, and Laramie Mountains on the south. The northern extent of the structural basin is the Miles City Arch and the Yellowstone River in Montana. The axis of the structural basin trends from the southeast to the northwest near the western margin of the syncline. The general area is located on the gently dipping eastern limb of the structural basin. In general, geologic strata along the eastern limb of the structural PRB dip to the west at 1 to 2 degrees toward the axis of the basin.

The Powder River Basin is so named because it is drained by the Powder River, although it is also drained in part by other major rivers, including the Big Horn, Tongue, Little Missouri, Belle Fourche, and Cheyenne rivers. The general analysis area is within the Powder River drainage basin. Hay Creek and Dry Fork Little Powder River, tributaries of the Powder River, are the most prominent natural topographic features in the general analysis area, though Rawhide Creek, Little Rawhide Creek, and Calf Creek also drain the immediate area.

Broad plains, rolling hills, and tablelands dominate the PRB landscape. Internally-drained playas are common in the basin, as are buttes and plateaus capped by sandstone or clinker (baked and fused rock resulting from in-place burning of coal deposits). Elevations throughout the PRB range from less than 2,500 feet to more than 6,000 feet above mean sea level. The major river valleys have wide, flat floors and broad floodplains. The drainages dissecting the basin are incised and typically are intermittent (do not flow year-round) or ephemeral (respond only to rainfall or snowmelt events) and, thus, do not provide year-round water sources.

The general analysis area is characterized by gently rolling uplands and relatively level agricultural fields. Many hills are dissected by drainages that create moderate variations in local relief. The overall topographic trend of hills is roughly northwest to southeast. Topography in the southern portion of the general analysis area exhibits a local southwest-to-northeast trend associated with an ephemeral drainage in sections 18 and 19. Map 3.0-1 identifies sections in the general analysis area.

Slopes range from flat in the northwestern part of the general analysis area to greater than 30% in the northeast. Topographic elevations range from about 4,080 feet above mean sea level along Hay Creek in section 16 (northeast) to about 4,380 feet above mean sea level in the east-central

portion of section 19 (southwest). Local relief is greatest in sections 8 and 9 (north-northeast), where drainages deeply dissect the uplands and create relatively steep slopes and prominent bluffs of sandstone that are resistant to erosion. The flattest portion of the general analysis area is in the broad valley bottom of Hay Creek in the north-central portion of section 18. A topographic depression encompassing about 8.8 acres is located in the west-central portion of that section.

3.2.2 Environmental Consequences

3.2.2.1 Proposed Action

Under the Proposed Action, surface coal mining would permanently alter the topography of the proposed tract through blasting, hauling, and stockpiling of overburden and interburden, as described in section 1.1.3.3. Mining would remove overburden and interburden to a combined average depth of approximately 250 feet and coal to a combined total depth of about 100 feet over approximately 419 acres. Mining support activities, described in section 1.1.3.3, would cause temporary surface disturbance a buffer area to the north of the proposed tract.

The postmining topography would be recontoured using methods described in section 1.1.3.4 to resemble the premining topography, but would be approximately 60 feet lower (table 3.2-1) and somewhat gentler and more uniform. The removal of coal would be partially offset by the swelling that occurs when overburden and interburden are blasted, excavated, and backfilled. Direct adverse impacts resulting from topographic moderation include a reduction in habitat diversity and microhabitats (e.g., cutbank slopes). These impacts would be greater in those areas characterized as rough breaks. Potential effects of topographic moderation on wildlife species are described in section 3.10. A direct beneficial impact of the lower and flatter terrain would be reduced water runoff, which would allow increased infiltration and a minor reduction in peak flows. This may help counteract the potential for increased erosion that could occur because of higher density of reclaimed soils near the surface (section 3.8.2.1). It may also increase vegetative productivity and potentially accelerate recharge of groundwater. In-channel stockponds and playas (i.e., shallow topographic depressions) would be replaced to provide livestock and wildlife watering sources. These topographic changes would not conflict with regional land use, and the postmining topography would be designed to adequately support the anticipated future land use. All postmining topography and water features must meet the specifications outlined in the mining and reclamation plan approved by the WDEQ/LQD.

Table 3.2-1. Overburden/Coal Thickness and Postmining Elevation Change

Average overburden thickness (including interburden)	250 feet
Average coal thickness	100 feet
Overburden swell factor	11%
Coal recovery factor	90%
Postmining elevation change[1]	–61 feet

[1] Reclaimed (postmining) elevation surface change is calculated as:
(overburden + unrecovered coal thicknesses) x (overburden swell) – (overburden + coal thicknesses)

3.2.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.2.2.3 Alternative 2

Under Alternative 2, surface coal mining would permanently alter the topography as described under the Proposed Action but over an area of up to 1,883 acres. Temporary surface disturbance from mining support activities would affect a 0.25-mile-wide area around the final tract configuration. The existing diversion of Hay Creek in the general analysis area would be expanded to direct flow into temporary channels around active mining areas, as needed, or that flow would be contained within temporary reservoirs to prevent pits from being flooded. Kiewit does not anticipate any further diversions on Hay Creek due to the operationally limited lands west of the county road. Additional mining and reclamation activities and postmining topography would be the same as described under the Proposed Action.

3.2.3 Regulatory Compliance, Mitigation, and Monitoring

WDEQ/LQD Rules and Regulations (Chapter 4) require that topography be restored as closely as possible to premining contour and that it blend into the existing, undisturbed topography as much as possible. If one of the action alternatives is implemented Kiewit will reconstruct features such as hills and draws to mimic premining conditions. Some local relief will be reduced after coal removal. The amount of coal that would be removed and the degree to which the overburden spoils would change in volume due to excavation would be considered in the postmine topography design. These designs will be developed for approval as part of the required mining and reclamation plans. All topographic features such as upland draws, channel bottoms, and elevations will be reconstructed to closely mimic premining conditions and ensure proper drainage of water across the reclaimed spoils. The WDEQ/LQD monitors topographic restoration by regularly checking the as-built topography in the annual reports filed by the mines to see if it conforms to the approved topography.

Under either of the action alternatives, Kiewit will reestablish vegetation in all reclaimed areas and implement sediment-control measures where runoff occurs to preserve reclaimed materials. Kiewit will monitor success of revegetation and erosion-control measures routinely, per WDEQ/LQD guidelines, and will implement mitigation measures, as necessary, to correct any deficiencies.

3.2.4 Residual Impacts

Topographic moderation is a permanent consequence of mining. Reclaimed landforms are expected to mimic premining topography, but will have less topographic variation and will be slightly lower in elevation. Any indirect impacts of topographic moderation on wildlife habitat diversity would also be considered permanent. See section 3.10 for indirect impacts on wildlife as a result of topographic moderation.

3.3 Geology, Mineral Resources, and Paleontology

This section discusses the topographic, geologic, and mineral resources in the general analysis area and adjacent Buckskin Mine permit area, including assessments of premine topography and pertinent information regarding geology, as well as coal, CBNG, and scoria resources.

3.3.1 General Geology and Coal Resources

3.3.1.1 Affected Environment

The general analysis area contains the following stratigraphic units (layers) (in descending order from the surface): Quaternary (recent) deposits, the Eocene Wasatch Formation, and the Paleocene Fort Union Formation. The Paleocene Fort Union Formation contains the coal seams that would be mined under the action alternatives. Table 3.3-1 shows the stratigraphic relationships of the geologic units in the general analysis area. These stratigraphic units are discussed below.

Quaternary deposits in the general analysis area consist of unconsolidated stream-laid deposits, slope wash, wind-blown deposits, colluvium, residuum, and scoria. Stream-laid deposits occur in portions of the Hay Creek valley bottom and some associated upland draws beyond the general analysis area for this EIS. Those deposits consist of a loose mix of sand, gravel, and silt deposited by stream flow within Hay Creek and its tributaries. Slope wash occurs along the bottom slopes of hills and in channel bottoms, including the Hay Creek valley bottom in section 18, and consists of reworked sediment deposited by flow over the ground surface (e.g., runoff). Some surface sands are concentrated into small areas comprised predominately of fine-grained sand. Residuum (residual material) deposits commonly cover and are derived in place from the underlying Wasatch deposits, and may occur on relatively steep terrain. Colluvium is comprised of material that has been transported downslope by rock falls, slides, and slumps, and occurs along steep hill sides. This material generally consists of large, angular scoria and rock fragments residing in an unsorted matrix of sand, silt, and clay. Materials above some of the shallow coal seams in the general analysis area have been altered by the natural combustion (burning) of underlying coal seams, producing scoria which dominates portions of the hillsides in sections 8 and 9.

Table 3.3-1. Stratigraphic Relationships and Hydrologic Characteristics, Powder River Basin, Wyoming

Geologic Unit			Hydrologic Characteristics
Recent Alluvium (Holocene)			Typically fine grained and poorly sorted in intermittent drainages. Occasional very thin, clean interbedded sand lenses. Low yields and excessive dissolved solids generally make these aquifers unsuitable for domestic, agricultural and livestock usage. Low infiltration capacity unless covered by sandy eolian blanket.
Clinker (Holocene to Pleistocene)			Baked and fused bedrock resulting from burning coal seams which ignite on the outcrop from lightning, manmade fires or spontaneous combustion. The reddish clinker (locally called scoria or red dog) formed by melting and partial fusing from the burning coal. The baked rock varies greatly in the degree of alteration; some is dense and glassy while some is vesicular and porous. It is commonly used as a road construction material and is an aquifer wherever saturated.
Wasatch Formation (Eocene)			Lenticular fine sands interbedded predominantly very fine grained siltstone and claystone may yield low to moderate quantities of poor to good quality water. The discontinuous nature and irregular geometry of these sand bodies result in low overall permeabilities and very slow groundwater movement in the overburden on a regional scale. Water quality in the Wasatch formation generally does not meet Wyoming Class I drinking water standards due to the dissolved mineral content. Some wells do, however, produce water of considerably better quality which does meet the Class I standard.
Fort Union Formation (Paleocene)	Tongue River Member	Wyodak Formation Splits: Anderson/ Canyon Seams	The coal serves as a regional groundwater aquifer and exhibits highly variable aquifer properties. Permeability and porosity associated with the coal arise almost entirely from fractures. Coal water typically does not meet Class I or Class II (irrigation) use standards. In most cases, water from coal wells is suitable for livestock use. The coal water is used throughout the region as a source of stock water and occasionally for domestic use.
	Lebo Member		The Lebo Member, also referred to as "The Lebo Confining Layer," has a mean thickness of 711 feet in the PRB and a thickness of about 400 feet in the vicinity of Gillette. The Lebo typically yields small quantities of poor quality groundwater. Where sand content is locally large, caused by channel or deltaic deposits, the Lebo may yield as much as 10 gpm.
	Tullock Member		The Tullock Member has a mean thickness of 785 feet in the PRB and a mean sand content of 53% which indicates that the unit generally functions well as a regional aquifer. Yields of 15 gpm are common buy vary locally and may be as much as 40 gpm. Records from the State Engineer's Office indicate that maximum yields of approximately 300 gpm have been achieved from this aquifer. Water quality in the Tullock Member often meets Class I standards. The extensive sandstone units in the Tullock Member are commonly developed regionally for domestic and industrial uses. The City of Gillette is currently using eight wells completed in this zone to meet part of its municipal water requirements.
Lance Formation (Upper Cretaceous)	Upper Lance		Sandstone and interbedded sandy shales and claystone provide yields generally of less than 20 gpm. Higher yields are sometimes achieved where sand thicknesses are greatest. Water quality is typically fair to good.
	Fox Hills Sandstone		Sandstone and sandy shales yield up to 200 gpm, however, yields are frequently significantly less. The water quality of the Fox Hills is generally good with TDS concentrations commonly less than 1000 milligrams per liter.
Lewis Formation (Upper Cretaceous)	Pierre Shale		This unit is comprised predominantly of marine shales with only occasional local thin sandstone lenses. Maximum yields are minor and overall the unit is not water bearing. Water obtained from this unit is poor with high concentrations of sodium and sulfate as the predominant ions is solution.

gpm = gallons per minute

Sources: Hodson et al. (1973) and Lewis and Hotchkiss (1981).

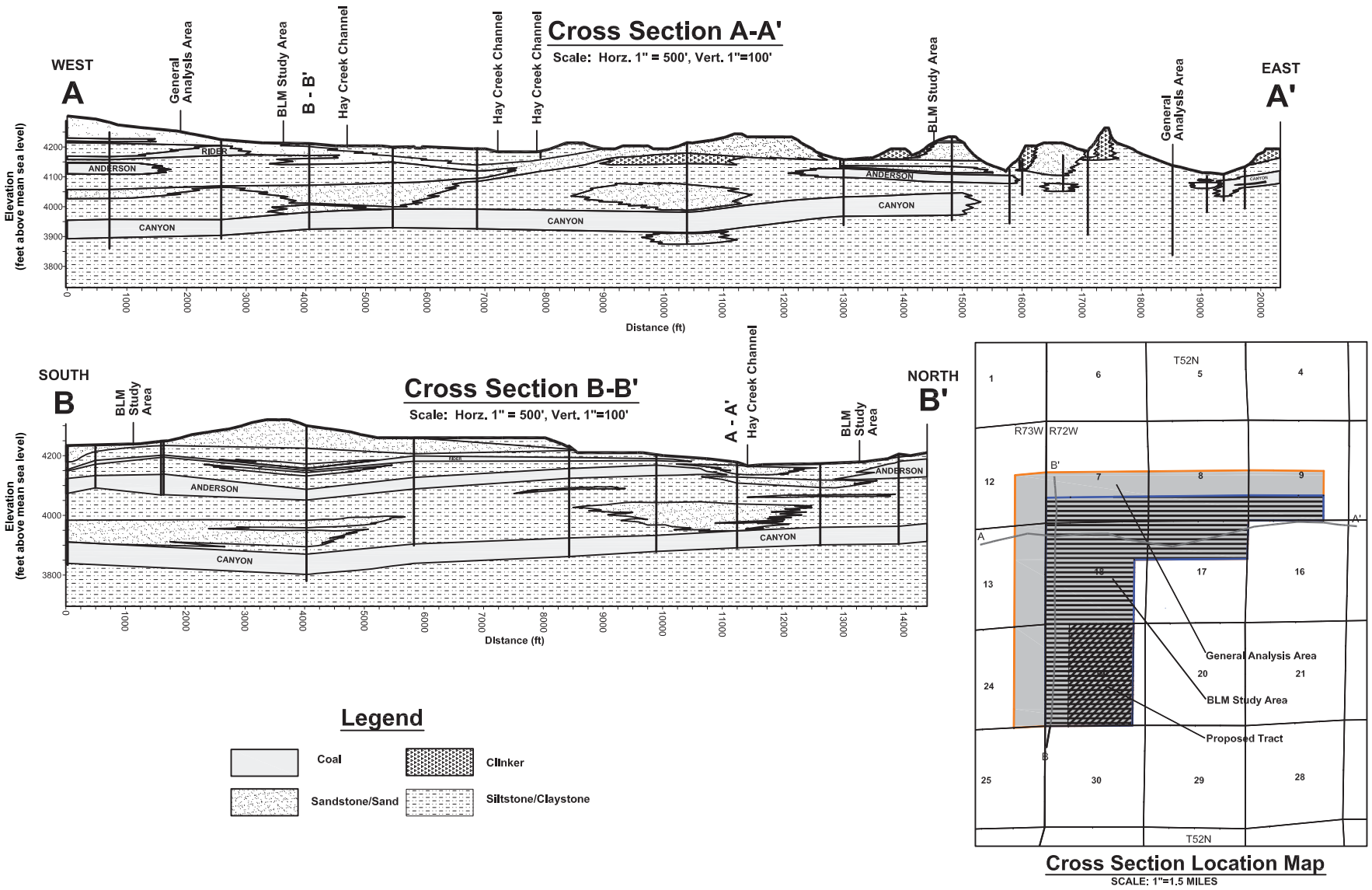
The Wasatch Formation in the general analysis area consists of sandstone, siltstone, shale, and thin coals that extend from the surface to the Anderson coal seam; that seam defines the top of the underlying Fort Union Formation. The Wasatch Formation is somewhat sandier than the underlying Fort Union Formation, especially near the surface, where sands can be traced laterally for considerable distances. The Rider coal seam occurs in the Wasatch Formation; it is present in much of the western portion of the general analysis area, but in the east the coal layer thins out, is eroded out, or is burned. The Rider seam is up to 15 feet thick in the general analysis area, but is not a target coal for mining.

The Wasatch Formation, in combination with any overlying Quaternary deposits, is considered overburden relative to the shallow-most (Anderson) coal seam that is targeted for mining in the general analysis area. The overburden thickness varies from about 30 to 200 feet. It is thinnest in low-lying draws in sections 8 and 9 and in the valley bottom of Hay Creek in section 18.

The Fort Union Formation lies between the Anderson and Canyon coal seams, and consists primarily of sandstones, siltstones, shales, mudstones, and coal. The formation is divided into the Tongue River, Lebo, and Tullock members. Two coal seams are present in the Tongue River Member of the Fort Union Formation, both of which are targeted for mining in the BLM study area (the maximum extent of leasable coal in the general analysis area). Two geologic cross sections through the proposed tract are shown on figure 3.3-1. The Anderson seam resides at the top of the Fort Union Formation and defines the contact between the Fort Union and the overlying Wasatch formations. The Canyon coal seam is lower in the Tongue River member, typically 150 to 190 feet beneath the Anderson, but it is within 40 feet of the Anderson where the seams are present in the northeastern portion of the BLM study area.

The Anderson coal seam is present in most of the western portion of the BLM study area (maximum coal lease boundary), but it is discontinuous and absent in most of the northern and eastern portions. Where present, it averages about 45 feet thick and ranges from about 30 to 65 feet thick. The Canyon coal seam is present in most of the western portion of the BLM study area, but it is absent in most of the eastern portion. Where present, it averages about 70 feet thick and ranges from about 55 to 75 feet thick.

The Canyon and Anderson coal seams are sub-bituminous and are generally low-sulfur, low-ash coals. In the BLM study area, the heating value of the coal seams is expected to range from 8,000 to 8,500 British thermal units (Btu) per pound. The ash content in the coal seams is expected to vary from 3.5 to 7.0%, the sulfur content from 0.2 to 0.5%, and the moisture content from 28 to 31%.



No warranty is made by the Bureau of Land Management for use of these data for purposes not intended by BLM.

Figure 3.3-1
North-South and East-West Geologic Cross Sections

3.3.1.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining would permanently alter the stratigraphic layers in the proposed tract from the base of the lowest coal seam mined to the surface. The Proposed Action would have a significant and permanent impact on geology and coal resources in the proposed tract. An average of about 250 feet of overburden and interburden, 30 feet of Anderson coal, and 70 feet of Canyon coal would be removed over about 419 acres. Approximately 54 million tons of coal would be recovered from the 77 million tons of in-place reserves. Overburden removed during mining would be replaced with a mixture of partially compacted rock and soil that would be significantly altered from the original distinct layers. Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance on an additional buffer area north of the proposed tract.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Coal removal and associated impacts would continue as currently permitted on existing coal leases, including surface and subsurface disturbance in the overlap between the general analysis area and the existing Buckskin Mine permit area. Those disturbances would be related to mining the existing contiguous leases, as described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the future.

Alternative 2

Under Alternative 2, overburden and coal would be removed in the same manner and to the same average depths as under the Proposed Action, but would occur over an area up to 1,883 acres. Up to 149.7 million tons of coal would be recovered from about 270 million tons of in-place reserves. Changes to premining stratigraphic layers and postmining backfill described under the Proposed Action would also occur under Alternative 2, but would affect more surface and underground areas. Alternative 2 would have a significant and permanent impact on geology and coal resources in the general analysis area. Temporary surface disturbance from mining support activities would affect a 0.25-mile-wide area around the final tract configuration.

3.3.1.3 Regulatory Compliance, Mitigation and Monitoring

WDEQ/LQD Rules and Regulations (Chapter 4) require that land be restored to conditions equal to or greater than the highest previous use. To accomplish this, the Buckskin Mine will continue the drilling and sampling programs conducted on existing leases to identify overburden material that may be unsuitable for reclamation (i.e., material that is unsuitable for revegetation in disturbed areas or that may affect groundwater quality due to high concentrations of certain elements). As part of the mine permitting process, the mine will develop a management plan to ensure that this unsuitable material is not placed in areas where it may affect groundwater quality or revegetation success. The mine will also develop a backfill monitoring plan as part of the

mine permitting process to evaluate the quality of the replaced overburden. These plans are in place for the existing Buckskin Mine and will be revised under either action alternative if a lease sale is held.

3.3.1.4 Residual Impacts

The action alternatives would have permanent significant impacts on the coal resources and geology in the general analysis area extending vertically from the base of the Canyon coal seam to the surface. Coal would be removed from the area, and the current layered stratigraphy would be transformed into a mixture of unconsolidated backfill material.

3.3.2 Other Mineral Resources

3.3.2.1 Affected Environment

The PRB contains large reserves of fossil fuels including oil, natural gas (from conventional reservoirs and from coal beds), and coal, all of which are currently being produced. In addition, uranium, bentonite, and scoria are mined in the PRB (Wyoming State Geological Survey 2003).

Conventional Oil and Gas

The Powder River structural basin is one of the richest petroleum provinces in the Rocky Mountain area. As of December 2006, the U.S. Geological Survey (USGS) estimated the mean levels of undiscovered oil and non-coal bed natural gas resources in the PRB as 639 million barrels of oil, 1.16 trillion cubic feet of natural gas, and 131 million barrels of natural gas liquids (USGS 2006). Conventional oil and natural gas (excluding CBNG) have been produced in the PRB for more than 100 years, with an estimated 500 fields producing oil or natural gas from oil-bearing strata during that period. Depths to conventional gas and oil-bearing strata generally range from 4,000 and 13,500 feet below grade, though some wells are as shallow as 250 feet.

No conventional oil and gas wells are located in the general analysis area.

Coal Bed Natural Gas

PRB coal bed methane (also known as CBNG) is naturally occurring methane trapped by water pressure in the coal or by impermeable strata above it. In the PRB, this gas is primarily biogenic in origin and is generated by large, subsurface, naturally occurring microbial communities residing in the coal (Ulrich and Bower 2008).

The BLM has completed numerous environmental assessments and three EISs analyzing CBNG projects in Wyoming. The most recent of these analyses is the Final EIS and Proposed Plan Amendment for the PRB Oil and Gas Project, referred to as the Wyoming PRB Oil and Gas EIS (BLM 2003). The EIS covers almost 12,500 square miles, encompasses almost the entire PRB and spans all or parts of Campbell, Converse, Johnson, and Sheridan counties, and covers private, state, and federal lands. It analyzes potential environmental impacts of CBNG development in the PRB, and assumes that approximately 39,400 new CBNG wells would be

drilled, completed, and produced over the next 10 years, in addition to the more than 12,000 CBNG wells that had been drilled or were permitted for drilling when the EIS was prepared.

Under favorable geologic conditions, methane can be trapped at shallow depths in and above coal seams; this commonly occurs in the PRB. CBNG has been commercially produced in this region since 1989 when production began at the Rawhide Butte Field, approximately 5 miles southwest of the general analysis area (De Bruin and Lyman 1999). CBNG exploration and development are currently ongoing throughout the PRB. The predominant CBNG production to date in the general analysis area has occurred from the Wyodak-Anderson coal zone, which includes the Anderson and Canyon coal seams at and adjacent to the Buckskin Mine. The Wyodak-Anderson zone appears to be gas-bearing throughout the PRB and, as described above, the methane in the coal beds has been determined to be biogenic in origin. CBNG is also produced from deeper coal beds in the PRB, below the Anderson and Canyon seams.

In order for CBNG to be collected, the hydrostatic pressure in the coal must be reduced to a level that can vary from seam to seam, which allows the gas to desorb (release) from the coal. This is accomplished by removing water from the coal bed. CBNG reservoirs can be affected by any nearby activities, including coal mining, that reduce the hydrostatic pressure in the coal bed or by the introduction of atmospheric oxygen or other substances which interfere with the metabolic processes of the methane producing bacteria which naturally occur there. The BLM Wyoming State Office–Reservoir Management Group (WSO-RMG) has recently prepared a variety of detailed analyses of CBNG resources in the lands near the existing surface coal mines in the Wyoming PRB for coal leasing and other actions. The WSO-RMG completed a report in 2006 that describes the existing/affected environment of the coal mining areas and adjacent lands with respect to CBNG resources, and documents the observed and inferred resource depletion that has and will continue to occur (WSO-RMG 2006).

WSO-RMG and the USGS have collected coal gas content data from coal cores near the mines and in other areas of the PRB. Measured gas content was minimal in all of the Wyodak-Anderson coal cores collected in 2000 at locations near the surface coal mines, indicating that the coal seams were already substantially depleted of CBNG in the vicinity of the mines at that time. Average total gas content from the core desorption analyses was approximately 6.8 standard cubic feet per ton near the coal mines in 2000, compared with an average measured gas content of 37.6 standard cubic feet per ton from coal cores taken outside the mining areas. Analyses performed by WSO-RMG, USGS, CBNG operators, and others have shown that dewatering of the coal beds, by both CBNG production and mine dewatering, reduces the hydrostatic pressure in the coals and allows the gas to desorb and escape from the coal, and decreases the anaerobic production of methane. These effects have been ongoing, and it is likely that desorption and decreased production has continued since 2000; as a result, coal gas content and the gas-in-place adjacent to the existing mines would currently be expected to be less than in 2000.

The Wyoming Oil and Gas Conservation Commission well data from the mining townships generally shows that operator interest in the eastern PRB mining areas peaked prior to 2000 and

declined rapidly following 2001. Activity had declined to almost negligible levels during 2005 (WSO-RMG 2006).

The Anderson and Canyon seams tapped for CBNG are the same seams that are being mined at Buckskin Mine. CBNG occurs in these seams within the general analysis area and is common in equivalent seams throughout the PRB. Wyoming Oil and Gas Conservation Commission records indicate that as of May 2008, 30 CBNG wells have been completed in the general analysis area (appendix E). Fifteen wells (13 in the Canyon seam and 2 in the Anderson seam) are producing and 3 wells (2 in the Canyon and 1 in the Anderson) have been shut in and may be re-instated for production in the future. Twelve other wells are no longer producing, have been permanently abandoned, or have expired permits (Wyoming Oil and Gas Conservation Commission 2009). Wyoming Oil and Gas Conservation Commission records indicate that no CBNG wells have been completed below the Anderson and Canyon seams within the general analysis area.

Manufactured Methane from Coal Beds

A large percentage of the discovered natural gas (methane) reserves are believed to have been generated through the anaerobic microbial process of methanogenisis (Rice and Claypool 1981). Methane gas produced in this manner is often referred to as biogenetic methane. This process uses a group of predominantly anaerobic microorganisms that metabolizes the complex organic molecules in hydrocarbon deposits and produces the gas as a waste product. Biogenic methane has been detected in a wide variety of unconsolidated sediment and rock types around the world, including PRB coals (Law et al. 1991; Rice 1993).

Luca Technologies Inc. has developed a method of producing biogenetic methane through methanogenisis. The company transforms uneconomically producing CBNG wells and uses the existing infrastructure for its coal conversion and methane production operations, which are handled by their directly owned subsidiary, Patriot Energy Resources. The company has completed a test project near Sheridan, Wyoming, and has begun operations using a chemical nutrient to feed the microbacteria currently residing in the PRB coal seams. These communities are currently capable of producing up to 30 million cubic feet per day when provided nutrients (DeBruyn pers. comm.). Methane produced in this manner has been commercially produced since 2007.

The amount of coal converted through methanogenisis is less than 1% at the current level of technology. The future rate of the technological development and production of methane using microbacteria is unknown at this time but it is expected that, with continued success and public demand for either methane, hydrogen, or other biological metabolic byproducts of the microbial consortia, such operations could remain in place for the foreseeable future and produce a product until the coal has been converted into carbon and other remnant components of PRB coal such as ash and sulfur. The company is exploring the possibility of developing the same technology to produce methane and/or other by-products from non-coal hydrocarbon substrates and deposits (DeBruyn pers. comm.).

Other Minerals

Bentonite, uranium, and scoria also are commercially produced in the PRB, though to a far lesser degree than the other resources discussed in this section. Layers of bentonite (decomposed volcanic ash) of varying thickness are present throughout the PRB. Some of the thicker layers are mined where they are near the surface, mostly around the edges of the basin. Bentonite has a large capacity to absorb water, making it usable in a number of common processes and products. Bentonite reserves have not been identified in the general analysis area.

Substantial uranium resources are found in southwestern Campbell and northwestern Converse counties. Uranium exploration and mining were quite active in the 1950s, when numerous claims were filed in the PRB. A decreased demand combined with increased foreign supply reduced uranium mining activities in the early 1980s, although staking of mining claims is currently increasing. No known uranium reserves exist in the general analysis area.

Scoria is present in the general analysis area and can be used for construction aggregate as well as a road treatment to provide traction in winter. Scoria occurs in relative abundance on portions of the hillsides in sections 8 and 9, along the northern edge of the general analysis area.

3.3.2.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining would have permanent impacts on oil and gas (conventional and CBNG) resources in and above the mined coal seam within the proposed tract (419 acres), but would have no impact on reserves below the lowest mined seam. Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance on an additional buffer area north of the proposed tract.

This action alternative would have no impact on bentonite, uranium, or scoria resources, because they are not present in the proposed tract.

During mining, other minerals present in the proposed tract could not be developed. Some of these other minerals could, however, be developed after coal mining and reclamation are completed. No conventional oil and gas wells are present in the proposed tract. No documented bentonite, uranium, or scoria resources are present either.

Thirteen producing CBNG wells are present in the general analysis area, which includes that tract. Before mining operations could begin, all active CBNG wells would have to be plugged and abandoned, and all gas production equipment would have to be removed. CBNG resources that have not been recovered from the Canyon and Anderson coal seams prior to mining would be lost when the coal is removed. Dewatering wells and active mining would combine with ongoing CBNG production to deplete the hydrostatic pressures and methane resources adjacent to mining areas a short time after mining would begin. It is also likely that any undrilled spacing units in the proposed tract will have been drained by production from the existing wells and nearby mining activity prior to initiation of mining. Mining operations within the proposed tract would not begin until permitting is completed, which generally requires several years after a

lease is acquired. By that time, it is likely that most of the economically recoverable CBNG resource would have been produced. Oil and gas (conventional and CBNG) reservoirs located below the mineable Canyon and Anderson coal seams would not be directly disturbed by coal removal. Those resources could be drilled and plugged prior to mining. Following mining and reclamation, oil and gas lessees could drill new wells to recover those resources from any productive reservoirs below the lowest mined coal seam. Redeveloping deep oil, gas, and CBNG reservoirs would likely occur only if the lessee believes that the value of the reserves justifies the expense of recompleting or drilling wells.

Alternative 1 (No Action)

Under the No Acton Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Coal removal and associated impacts would continue as currently permitted on existing coal leases, including surface and subsurface disturbance in the overlap between the general analysis area and the existing Buckskin Mine permit area related to mining the existing contiguous leases. Those activities would have permanent impacts on scoria reserves in portions of the overlap area. Gas resources could be developed uninterrupted. Indirect impacts on CBNG resources, described above, would continue as a result of dewatering activities in the overlap area. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining would have permanent impacts on oil and gas (conventional and CBNG) reserves in and above the mined coal seam as described under the Proposed Action, but would have no impact on reserves below the lowest mined seam. Impacts would occur over an area of up to 1,883 acres. Gas reserves below the lowest mined coal seam would still be accessible to operators after mining and reclamation have been completed. No conventional oil and gas wells, bentonite, or uranium resources are present in the general analysis area. Mining would remove or reduce the scoria hills along the northern extent of the general analysis area, resulting in a permanent loss of those resources and a change in topographic relief. Temporary surface disturbance from mining support activities would affect a 0.25-mile-wide area around the final tract configuration.

3.3.2.3 Regulatory Compliance, Mitigation, and Monitoring

The potential does exist for conflicts between coal operations and CBNG and conventional oil and gas wells completed, ongoing, or possible in formations and coal beds below the Canyon and Anderson seams.

If the federal coal in the tracts is leased and conflicts do develop between the various industry operators under the action alternatives, several mechanisms are in place that can be used to facilitate recovery of the conventional oil and gas and CBNG resources prior to mining. These mechanisms include:

- The BLM could attach a multiple mineral development stipulation to the federal coal lease, which states that the BLM has the authority to withhold approval of coal mining operations that would interfere with the development of mineral leases issued before the coal lease (see appendix D).
- Conventional oil and gas wells could be abandoned during mining and reclamation operations, then be recompleted or redrilled following mining.
- The BLM could offer royalty incentives to CBNG operators to accelerate production, as provided for in the BLM Instruction Memorandum (2003-253), to recover the natural gas while simultaneously allowing uninterrupted coal mining operations. This memorandum also states that it is the policy of the BLM to encourage oil and gas and coal companies to resolve conflicts between themselves; when requested, the BLM will assist in facilitating agreements between the companies.
- Mining the proposed tract or alternative tract configuration cannot occur until the coal lessee has a permit to mine the tract approved by the WDEQ/LQD and a Mineral Leasing Act mining plan approved by the Secretary of the Interior. Before the mining plan can be approved, the BLM must approve the Resource Recovery Protection Plan for mining the tract. Prior to approving the plan, the BLM can review the status of CBNG and conventional oil and gas development and the mining sequence proposed by the coal lessee. The permit approval process generally takes the coal lessee several years, during which time CBNG resources can be recovered.
- Prior to mining the federal coal reserves, Kiewit could negotiate an agreement with owners and operators of existing oil and gas and pipeline facilities, regarding removal and relocation of their infrastructure.

Scoria is often removed during mining because its use in construction is deemed viable enough to segregate it from other overburden materials. It may be feasible to recover scoria from the overburden in sections 8 and 9 as part of the overburden removal process. Scoria not disturbed by mining under the action alternatives could also be removed after mining.

3.3.2.4 Residual Impacts

Scoria deposits excavated for construction or other uses would be permanently removed. CBNG resources not recovered before mining would be vented to the atmosphere and permanently lost. Oil and gas resources (conventional and CBNG) below the lowest coal seam to be mined could be recovered when mine operations are completed.

3.3.3 Paleontology

3.3.3.1 Affected Environment

Two formations exposed on the surface of the proposed tract could contain paleontological resources: the Paleocene Fort Union Formation and the Paleocene and Eocene Wasatch Formation (Breckenridge 1974; Love and Christiansen 1985). Both of these sedimentary formations are known to yield vertebrate fossils in Wyoming (Estes 1975; Roehler 1991; Secord 1998; Robinson et al. 2004).

The BLM's Potential Fossil Yield Classification system ranks geologic formations based on their potential to yield significant paleontological resources. The five main classes in the system are:

- class 1 – very low
- class 2 – low
- class 3 – moderate or unknown
- class 4 – high
- class 5 – very high

Additional subcategories have been identified within some classes. Under this classification system, the Fort Union Formation in the PRB is considered to be class 4 and the Wasatch Formation in that region is a class 3a (Hanson pers. comm.). A more detailed description of the two classifications for the Fort Union and Wasatch formations is provided below.

Class 3—Moderate or Unknown. Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence; or sedimentary units of unknown fossil potential.

- often marine in origin with sporadic known occurrences of vertebrate fossils;
- vertebrate fossils and scientifically significant invertebrate or plant fossils known to occur intermittently, predictability known to be low; or
- poorly studied and/or poorly documented; potential yield cannot be assigned without ground reconnaissance.

Class 3a—Moderate Potential. Units are known to contain vertebrate fossils or scientifically significant nonvertebrate fossils, but these occurrences are widely scattered. Common invertebrate or plant fossils may be found in the area, and opportunities may exist for hobby collecting. The potential for a project to be sited on or impact a significant fossil is low but is somewhat higher for common fossils.

Class 4—High. Geologic units containing a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented but may vary in occurrence and predictability. Surface-disturbing activities may adversely affect paleontological resources in many cases.

Class 4a—Unit is exposed with little or no soil or vegetative cover. Outcrop areas are extensive with exposed bedrock areas often larger than 2 acres. Paleontological resources may be susceptible to adverse impacts from surface-disturbing actions. Illegal collecting activities may impact some areas.

Class 4b—Areas underlain by geologic units with high potential but have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation due to moderating circumstances. The bedrock unit has high potential, but a protective layer of soil, thin alluvial material, or other conditions may lessen or prevent potential impacts on the bedrock resulting from the activity.

- Extensive soil or vegetative cover; bedrock exposures are limited or not expected to be impacted.
- Areas of exposed outcrop are smaller than 2 contiguous acres.
- Outcrops form cliffs of sufficient height and slope so that impacts are minimized by topographic conditions.
- Other characteristics are present that lower the vulnerability of both known and unidentified paleontological resources (BLM 2007b).

As a result of the 2007 paleontological survey findings (described below), the classifications for the Fort Union and Wasatch formations in the PRB have changed. The Fort Union Formation was upgraded from a class 3 to a class 4 statewide average and the Wasatch Formation in the PRB was downgraded to class 3a, although outside the PRB the Wasatch is a class 5 statewide (Hanson pers. comm.).

Fossils other than vertebrates that occur in the Fort Union Formation include gastropods (limpets, snails and slugs), bivalves (oysters, mussels, and clams) and plant fossils. Fossils that occur in the Wasatch Formation include mammals, birds, fish, and reptiles (Jones & Stokes 2007).

A pedestrian reconnaissance survey for fossils was conducted in November 2007 for the general analysis area. All outcrops were closely inspected, including bare, sparsely vegetated, or thin soil areas; stream and drainage bank exposures; large colluvium, lag areas, and colluvium near outcrops. Several fossil types were found during the survey in four locations. Of the four localities, three were outside of the proposed tract but in the general analysis area, and one was within the BLM study area. Fossils found include: crocodilian scutes (bone plates under the skin); a short segment of a limb bone from a large mammal; a small unidentifiable bone fragment (possibly crocodile); gastropod shell fragments; and small, highly weathered, fossilized wood fragments from the Fort Union. None of these fossils is considered significant or of high scientific value. While the occurrences of crocodilian scutes, the limb bone, and small bone

fragments are notable because they are the only vertebrate fossils currently known from the PRB Fort Union Formation, they are not considered to be of high scientific value because they were solitary finds, and no sign of other vertebrate fossils was observed in the immediate area. In addition, the mammalian species to which the limb bone segment belongs could not be determined: neither the taxon nor element represented by the bone fragment could be identified (Jones & Stokes 2007). While these findings indicate other vertebrate fossils could be found in the general analysis area, the likelihood of such a find would be minimal.

No significant or unique paleontological resources or localities have been recorded within the general analysis area, no specific mitigation was recommended for paleontology, and no further paleontological work was recommended or required.

3.3.3.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining would have no impact on significant or unique paleontological resources on the surface of the proposed tract; however, paleontological resources beneath the surface of the proposed tract (419 acres) could be permanently lost. No significant fossils were found in the outcrops of the Fort Union and Wasatch formations exposed on the surface of the proposed tract. However, fossils with scientific significance could be present but not exposed at the surface. Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance on an additional buffer area north of the proposed tract.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Coal removal and associated impacts on paleontological resources, similar to those described above, would only occur in the overlap between the general analysis area and existing permit area as a result of currently permitted mining activities. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining would have no impact on significant or unique paleontological resources on the surface of the general analysis area; however, paleontological resources beneath the surface could be permanently lost on up to 1,883 acres. Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance within a 0.25-mile-wide buffer around the final tract configuration.

3.3.3.3 Regulatory Compliance, Mitigation, and Monitoring

If a tract is leased under one of the action alternatives, the BLM will attach a stipulation (appendix D) to the lease requiring the operator to report significant paleontological finds to the

authorized federal agency and suspend production in the vicinity of the find until an approved paleontologist can evaluate the paleontological resource.

3.3.3.4 Residual Impacts

Paleontological resources not identified and removed prior to or during mining operations would be permanently lost. No such incidents have occurred within the existing Buckskin Mine lease, or elsewhere in the PRB coal region.

3.4 Air Quality

This section summarizes the affected environment in the general analysis area and the potential air quality impacts of the Proposed Action and alternatives. Appendix F provides background information on the air quality regulatory framework, regional conditions, modeling efforts, and the best available control technology (BACT) process. That appendix also provides the history of monitoring for particulate matter in the PRB. The information presented in this section and in appendix F is based on data provided by the Buckskin, Eagle Butte, Rawhide, Dry Fork, and Wyodak mines and from various state and federal sources. Existing and projected cumulative air quality impacts are discussed in chapter 4.

3.4.1 Background

3.4.1.1 Air Quality Determinants

The air quality of any region is controlled primarily by the magnitude and distribution of pollutant emissions and the regional climate. The transport of pollutants from specific source areas is strongly affected by local topography, winds (speed and direction), and precipitation. In the mountainous region of the western U.S., topography is particularly important in channeling pollutants along valleys, creating upslope and downslope circulations that may entrain airborne pollutants, and blocking the flow of pollutants toward certain areas. Local effects, however, are commonly superimposed on the general widespread weather regime and are only important during those periods when the large-scale wind flow is weak.

Wyoming can be characterized as having a combination of both highland and mid-latitude semiarid climates. The dominant factors that affect the climate of the area are elevation, local relief, and the mountain barrier effect. This barrier effect can produce marked temperature and precipitation differences between windward and leeward slopes. Generally, temperatures decrease and precipitation increases with increasing elevation. Section 3.1.1 contains additional information about the meteorology and climate in the general analysis area.

The general analysis area (map 3.0-1) is located in the northern portion of the PRB. The topography is primarily rolling plains and tablelands of moderate relief with occasional valleys and buttes. Elevations range from about 4,080 to 4,380 feet above mean sea level. The Big

Horn Mountains lie approximately 60 miles to the west and the Black Hills lie approximately 60 miles to the east.

3.4.1.2 Applicable Air Quality Standards and Regulations

The CAA requires the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. These standards define the maximum level of air pollution allowed in the ambient air. The CAA established NAAQS for six pollutants, known as "criteria" pollutants, which "… cause or contribute to air pollution which may be reasonably anticipated to endanger public health or welfare and the presence of which in the ambient air results from numerous or diverse mobile or stationary sources." The six, present-day criteria pollutants are lead, nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), ozone (O_3), and particulate matter (PM_{10} and $PM_{2.5}$), where PM_{10} is coarse particulate with mean aerodynamic diameters less than 10 microns and $PM_{2.5}$ is fine particulate with a diameter of 2.5 microns or less. Both particle sizes are small enough to penetrate into the lungs; $PM_{2.5}$ in particular can cause serious health problems.

Air quality regulations applicable to surface coal mining include the NAAQS, Wyoming Ambient Air Quality Standards (WAAQS), prevention of significant deterioration (PSD), new source performance standards, and the Federal Operating Permit Program (Title V). These regulatory programs are described in appendix F. Air pollution impacts are limited by local, state, tribal, and federal air quality regulations and standards, and state implementation plans (SIPs) established under the CAA and the Clean Air Act Amendments of 1990. In Wyoming, air pollution impacts are managed by the WDEQ/AQD under the Wyoming Air Quality Standards and Regulations and the EPA-approved SIP. A memorandum of agreement dated January 24, 1994, between EPA and the State of Wyoming allows the WDEQ/AQD to use particulate monitoring in lieu of short-term modeling to assess 24-hour compliance and to predict short-term ambient impacts from mining. Annual impacts are predicted using the industrial source complex long-term model, version 3 (ISC3LT). Appendix F contains a more detailed discussion of compliance and BACT demonstration.

3.4.1.3 Emissions Sources in the General Analysis Area

Air quality conditions in rural areas are typically better than in large, urban, or heavily industrialized areas. The northern PRB is a semi-industrial area containing six surface coal mines, multiple power plants, numerous natural gas wells and conventional oil and gas wells, and supporting rail and road infrastructure. Occasional high concentrations of CO, O_3, and particulate matter may occur in this region as well as in the urban areas of Gillette, Sheridan, and Buffalo, especially under stable atmospheric conditions that occur during winter.

The major types of emissions that come from surface coal mining activities are in the form of fugitive dust and tailpipe emissions from large mining equipment. Activities such as blasting, excavating, loading and hauling overburden and coal, and the large areas of disturbed land produce fugitive dust. Stationary or point sources are associated with coal crushing, storage, and handling facilities. In general, PM_{10} particulate matter is the major significant pollutant from

coal mine point and fugitive sources. Emissions of nitrogen oxides (NO_x) from blasting and mining equipment exhaust can also be significant, particularly at the larger surface mines in the southern PRB.

As discussed in appendix F, NO_2 is a product of incomplete combustion at sources such as gasoline- and diesel-burning engines or from mine blasting activities. Generally, blasting-related NO_x emissions are more prevalent at operations that use the technique referred to as cast blasting (Chancellor pers. comm.). This describes a type of direct blasting in which the explosion is designed to cast the overburden from on top of the coal into the previously mined area. The Buckskin mine does not use this technique and does not anticipate doing so in the future. The higher strip ratios (ratio of overburden to coal) at Buckskin do not lend themselves to dragline excavation, with which cast blasting is commonly associated.

Concentrations of the six criteria pollutants in the PRB and applicable standards are shown in table 3.4-1.

Non-mining air pollutant emission sources in the region include:

- emissions exhaust (primarily CO and NO_x) from existing natural-gas-fired compressor engines used in production of natural gas and CBNG;
- gasoline and diesel vehicle tailpipe emissions of combustion pollutants, volatile organic compounds, carbon dioxide (CO_2), NO_x, PM_{10} particulate matter, $PM_{2.5}$ particulate matter, and SO_2;
- dust (particulate matter) generated by vehicle travel on unpaved graded roads, windblown dust from neighboring areas, agricultural activities such as plowing, and paved road sanding during the winter months;
- transport of air pollutants from emission sources located outside the region;
- emissions from railroad locomotives used to haul coal (primarily NO_2 and PM_{10}); and
- SO_2 and NO_x from power plants.

3.4.2 Particulate Emissions

3.4.2.1 Affected Environment

Particulates include solid particles and liquid droplets that can be suspended in air. Particulates, especially fine particulates such as $PM_{2.5}$, have been linked to numerous respiratory related illnesses and can adversely affect individuals with pre-existing heart or lung diseases. They are also a major cause of visibility impairment in many parts of the U.S. While individual particles cannot be seen with the naked eye, collectively they can appear as black soot, dust clouds, or gray hazes.

Table 3.4-1. Six Criteria Air Pollutant Concentrations and Applicable Standards in the Powder River Basin (µg/m³)

Criteria Pollutant	Averaging Time[1]	Background Concentration	Primary NAAQS[2]	Secondary NAAQS[2]		PSD Class I Increments	PSD Class II Increments
CO	1-hour	3,336[4]	40,000	40,000	40,000	—	—
	8-hour	1,381	10,000	10,000	10,000	—	—
NO_2	Annual	5[5]	100	100	WAAQS 100	2.5	25
O_3	8-hour	70[6]	147	147	147	—	—
SO_2	3-hour	181[7]	—	1,300	1,300	25	512
	24-hour	62[7]	365	—	260	5	91
	Annual	13[7]	80	—	60	2	20
PM_{10}[8]	24-hour	54[9]	150	150	150	8	30
	Annual	13[9]	—	—	50	4	17
$PM_{2.5}$[8]	24-hour	13[10]	35	35	65	—	—
	Annual	4[10]	15	15	15	—	—

µg/m³ = micrograms per cubic meter; NAAQS = National Ambient Air Quality Standards; WAAQS = Wyoming Ambient Air Quality Standards; PSD = Prevention of Significant Deterioration increment values; CO = carbon monoxide; NO_2 = nitrogen dioxide; 0_3 = ozone; SO_2 = sulfur dioxide; PM_{10} = particulate matter measuring 10 microns or less in diameter; $PM_{2.5}$ = particulate matter measuring 2.5 microns or less in diameter.

1 Annual standards are not to be exceeded; short-term standards are not to be exceeded more than once per year.

2 Primary standards are designed to protect public health; secondary standards are designed to protect public welfare.

3 All NEPA analysis comparisons to the PSD increments are intended to evaluate a threshold of concern and do not represent a regulatory PSD Increment Consumption Analysis.

4 Data collected by Amoco at Ryckman Creek for an 8-month period during 1978–1979, summarized in Riley Ridge EIS).

5 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002.

6 Data collected at Thunder Basin National Grassland, Campbell County, Wyoming in 2002–2004 (8-hour 4th high).

7 Data collected by Black Hills Power & Light at Wygen 2, Campbell County, Wyoming in 2002.

8 On October 17, 2006, the EPA published final revisions to the NAAQS for particulate matter that took effect on December 18, 2006. The revision strengthens the 24-hour $PM_{2.5}$ standard from 65 to 35 µg/m³ and revokes the annual PM_{10} standard of 50 µg/m³. The State of Wyoming entered into rulemaking to revise the WAAQS.

9 Data collected at the Eagle Butte Mine, Campbell County, Wyoming in 2002.

10 Data collected at the Buckskin Mine 2002.

Source: BLM 2005b.

The current (since December 2006) EPA 24-hour air quality standard for $PM_{2.5}$ is 35 micrograms per cubic meter (µg/m^3), a reduction from the previous level of 65 µg/m^3. The current annual $PM_{2.5}$ standard is 15 µg/m^3. The current 24-hour standard for PM_{10} particulates is 150 µg/m^3. The annual PM_{10} standard of 50 µg/m^3 was revoked during the EPA revisions of air quality standards in 2006. In view of the December 2006 revisions to the NAAQS for particulate matter, the State of Wyoming entered into rulemaking to revise the WAAQS for particulate matter so that they remain as stringent as or more stringent than the NAAQS. Current federal ambient air standards for all six criteria pollutants are shown in table 3.4-1, including those for current PM_{10} and $PM_{2.5}$ standards in Wyoming. Additional information on the history of this process is provided in appendix F.

The PRB has one of the most extensive networks of monitoring sites for PM_{10} in the U.S.; most of these monitoring sites are funded and operated by the coal mines. The WDEQ/AQD requires that such information is collected to document the quality of the air resource at each of the PRB mines. According to EPA AirData, 36 PM_{10} monitors, 6 $PM_{2.5}$ monitors, and 6 total suspended particles (TSP) monitors were stationed in the Wyoming portion of the PRB in 2007. Data for TSP and PM_{10} date back to 1980 and 1989, respectively. Approximately 57,000 TSP samples were collected through 2004, and approximately 47,550 PM_{10} samples through 2007. Information about the regulatory framework, the monitoring network, and PM_{10} concentration trends since monitoring began are included in appendix F. Existing site-specific air quality information is included in the air quality data report, which can be viewed at the BLM High Plains District Office in Casper, Wyoming.

The Buckskin Mine ambient monitoring network consists of two low-volume Rupprecht & Patashnick Tapered Element Oscillating Microbalance (TEOM) PM_{10} particulate continuous monitors. The monitors were installed in late October 2000 to replace two high-volume TSP monitors located at the same sites. The continuous monitors collect uninterrupted, hourly average concentrations for particulate matter. The TEOM monitors meet the EPA Automated Equivalency Method (EQSA-0495-100). The particulate and meteorological monitoring network is operated in accordance with the *Buckskin Mine Quality Assurance Project Plan* (Buckskin Mining Company 2001), which was updated in 2008. Although they are no longer used at the Buckskin Mine, TSP monitoring is still conducted in some PRB locations, in part to serve as an indication of overall atmospheric levels of particulate matter.

The former high-volume air quality monitors at Buckskin sampled TSP every six days for a 24-hour cycle. The continuous TEOM monitors in use since 2000 are identified as west TEOM monitor (AQS ID: 0884) and north TEOM monitor (original AQS ID: 0899). In 2008, the north TEOM monitor was moved to a WDEQ/AQD approved location just outside the existing Buckskin Mine permit boundary (new AQS ID: 1899). The new site is more representative of ambient air and better positioned to measure both meteorological conditions and air quality impacts from mining. A meteorological station is also located at the new north TEOM monitor site. Current monitor locations are shown on map 3.4-1.

Table 3.4-2 provides the annual average, maximum, and second-highest PM_{10} concentrations for each monitor. These data were collected from 2002 through 2007. Annual coal and overburden production are also presented for reference. Figure 3.4-1 presents the same information in graphic form.

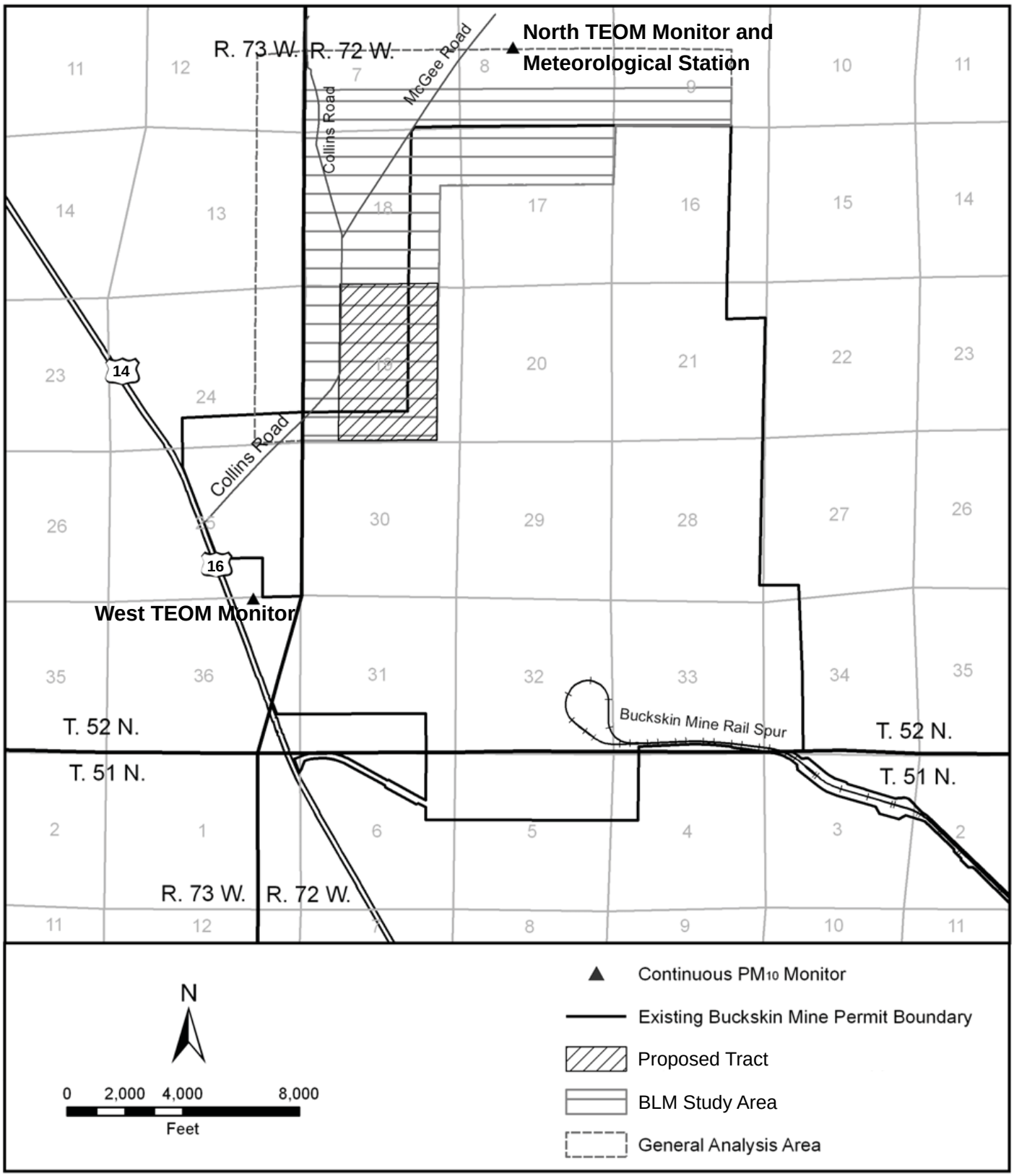
Table 3.4-2. Buckskin Mine Annual PM_{10} Monitoring Results and Production (µg/m³)

		North TEOM Monitor			West TEOM Monitor				
Year	Quarter	Average	High	2nd High	Average	High	2nd High	Coal/Year (mmt)	Overburden/ Year (mmbcy)
2002	1	14.9	37.5	34.1	12.9	34.9	30.9		
	2	20.0	95.7	73.4	18.3	60.9	43.4		
	3	25.1	191.7[1]	71.0	21.9	70.5	57.9		
	4	11.1	29.3	22.6	11.5	25.7	23.3		
	Annual	17.8	191.7	95.7	16.2	70.5	60.9	18.3	36.5
2003	1	10.9	35.1	29.8	10.7	49.7	23.4		
	2	15.6	56.3	42.7	14.2	41.3	39.2		
	3	29.2	77.6	76.9	26.5	80.1	63.0		
	4	15.1	47.6	40.3	18.0	202.4[2]	139.1		
	Annual	17.7	77.6	76.9	17.4	202.4	129.1	17.5	31.9
2004	1	14.5	53.7	47.5	13.4	47.3	41.4		
	2	18.7	116.3	41.1	16.8	74.9	33.3		
	3	20.1	42.3	40.2	17.7	38.5	33.7		
	4	13.6	40.1	33.8	11.7	27.7	25.6		
	Annual	16.7	116.3	53.7	14.9	74.9	47.3	20.3	29.5
2005	1	14.0	78.5	47.0	12.7	48.5	30.9		
	2	16.4	68.8	58.7	14.9	48.5	46.6		
	3	25.3	60.0	51.6	24.4	61.1	53.8		
	4	13.1	42.2	41.3	12.3	57.1	32.8		
	Annual	17.2	78.5	68.8	16.1	61.1	57.1	19.6	26.1
2006	1	13.1	41.9	38.3	14.7	54.1	47.2		
	2	21.7	72.1	60.7	19.0	58.6	49.6		
	3	34.2	101.4	84.7	28.5	63.7	58.5		
	4	16.9	63.6	58.2	14.1	39.0	34.5		
	Annual	21.5	101.4	84.7	19.1	63.7	58.6	22.8	27.1
2007	1	18.9	244.0[1]	59.9	17.0	177.7[1]	62.9		
	2	20.2	102.5	59.0	19.6	75.3	54.5		
	3	40.2	107.3	84.6	31.1	72.5	68.9		
	4	18.4	75.6	65.9	13.6	53.7	42.8		
	Annual	24.4	244.0	107.3	20.3	177.7	75.3	25.3	31.7

PM_{10} = particulate matter measuring 10 microns or less in diameter; TEOM = Tapered Element Oscillating Microbalance; mmt = million tons; mmbcy = million bank cubic yards

[1] Exceeded 24-hr standard of 150 µg/m³; WDEQ/AQD deemed "exceptional event" due to high winds.

[2] Exceeded 24-hr standard of 150 µg/m³; WDEQ/AQD deemed as official exceedance.



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Map 3.4-1
Buckskin Mine Ambient Air Monitoring Network

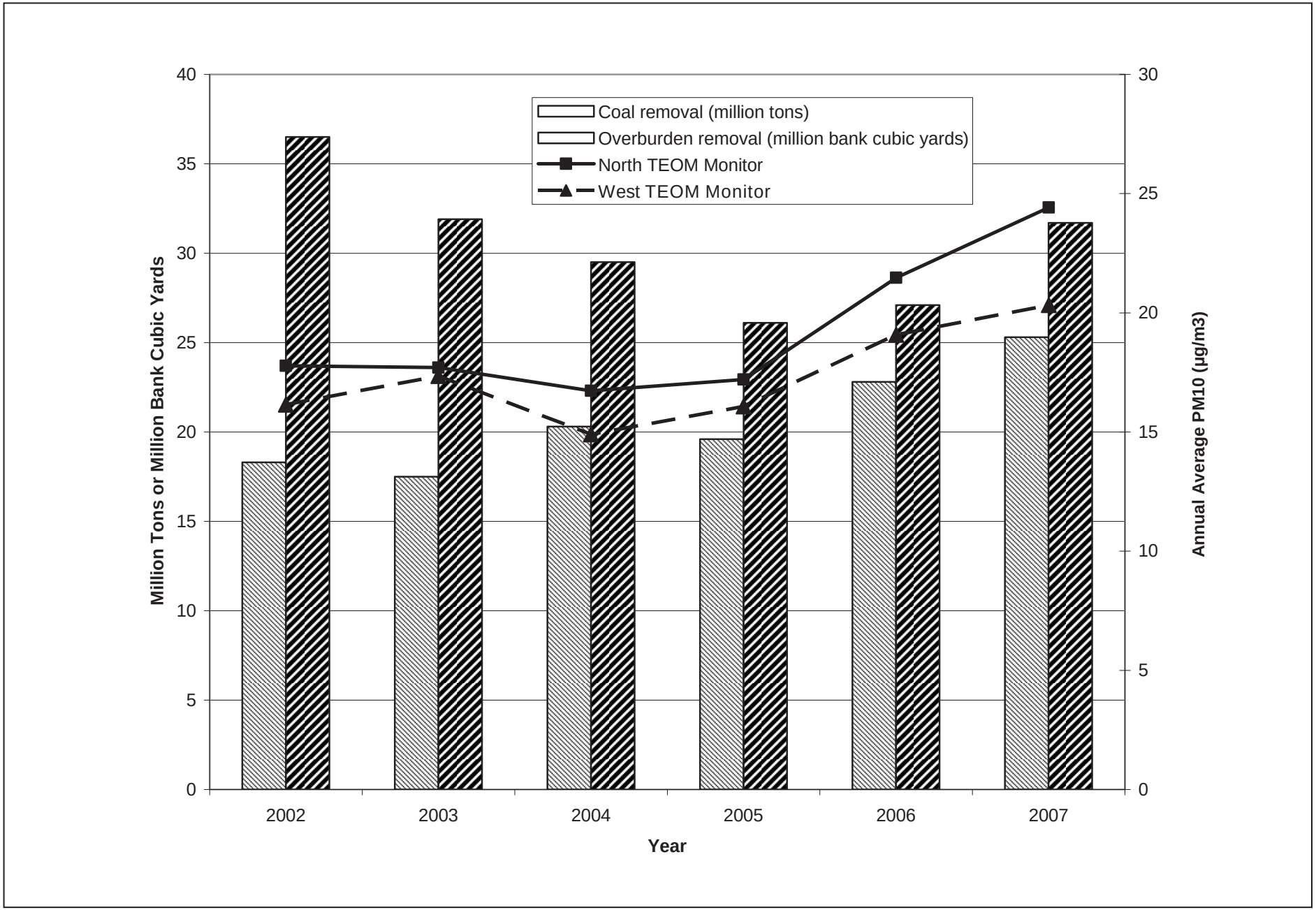

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Figure 3.4-1
Buckskin PM_{10} Monitoring History

Results from the Buckskin Mine 24-hour PM_{10} monitors surpassed the 24-hour annual average standard (150 µg/m^3) on only three occasions since monitoring began. On August 16, 2002, the north TEOM monitor recorded a maximum 24-hour PM_{10} concentration of 191.7 µg/m^3. On December 27, 2003, the west TEOM monitor recorded a maximum 24-hour PM_{10} concentration of 202.4 µg/m^3. On March 27, 2007, the north TEOM monitor measured a maximum 24-hour PM_{10} concentration of 244.0 µg/m^3; the west TEOM monitor recorded a maximum of 177.7 µg/m^3 the same day. The 2002 and 2007 measurements correlated with strong winds (e.g., more than 33 mph with gusts of 42 mph) and were judged as "exceptional events" by the WDEQ/AQD, as provided for by the recently implemented Natural Events Action Policy (NEAP). Therefore, those two overages were not counted as official exceedances by the WDEQ/AQD. No extraordinary winds or other weather conditions occurred during the 2003 measurement, and the WDEQ/AQD considered that event as an exceedance. In all three cases, the Buckskin Mine followed all mitigation and documentation procedures as required by the NEAP, including submitting detailed reports of the exceedance and accompanying meteorological conditions to the WDEQ/AQD.

The northern group of mines consists of five mines in addition to Buckskin: Dry Fork, Eagle Butte, Fort Union, Rawhide, and Wyodak. All of the mines, with the exception of Fort Union, operate in accordance with a Quality Assurance Project Plan specific to each mine. The Fort Union Mine has not been in operation for the last several years. Table 3.4-3 summarizes the monitors that are currently in operation at these mines. The maximum and second maximum annual PM_{10} results are also presented.

Table 3.4-3. Northern PRB Mines: 24-Hour PM_{10} Monitoring Results by Year (µg/m^3)

	Mine	Dry Fork		Eagle Butte			Rawhide		Wyodak	
Year	Sampler	DF-1	DF-N/3M	EB-2	EB-5	EB-N/3S	Hilltop (TEOM)	North (TEOM)	Site 1	Site 4 (TEOM)
2002	Max 24-hr	85	49	143	54	74	NA	NA	52	NA
	2nd-High 24-hr	79	34	66	36	66	NA	NA	48	NA
2003	Max 24-hr	96	45	65	47	76	NA	NA	52	NA
	2nd-High 24-hr	95	33	61	34	76	NA	NA	50	NA
2004	Max 24-hr	73	25	62	40	66	61	43	79	131
	2nd-High 24-hr	70	24	61	33	64	39	42	62	92
2005	Max 24-hr	113	29	60	49	115	76	61	129	165*
	2nd-High 24-hr	107	27	53	48	85	70	59	69	126
2006	Max 24-hr	112	68	73	47	99	72	78	96	143
	2nd-High 24-hr	103	44	60	46	93	72	75	71	95
2007	Max 24-hr	109	44	168*	41	144	107	178*	143	129
	2nd-High 24-hr	101	40	65	39	139	101	84	100	122

µg/m^3 = micrograms per cubic meter; PRB = Powder River Basin; PM_{10} = particulate matter measuring 10 microns or less in diameter; TEOM = Tapered Element Oscillating Microbalance

* Exceeded 24-hr standard of 150 µg/m^3 ; WDEQ/AQD deemed "exceptional event" due to high winds.

NA = Sampler not installed

Collectively, the five other mines in the northern group exceeded the 24-hr PM_{10} NAAQS annual average of 150 µg/m^3 three times during the last six years (2002 through 2007). In 2005, the Wyodak Mine recorded a value of 165 µg/m^3. In 2007, the Eagle Butte and Rawhide mines recorded 168 µg/m^3 and 178 µg/m^3, respectively. All three values were deemed "exceptional events" by WDEQ due to high winds.

The WDEQ/AQD requires that surface mine permits compile detailed emissions inventories and demonstrate compliance with NAAQS before permit amendments are granted. A BACT analysis is also required to demonstrate the use of "best available technology" in controlling point and fugitive PM_{10} emissions. In 2006, the Buckskin Mine submitted detailed PM_{10} modeling analyses to the WDEQ/AQD in support of a request for a permit modification. The $PM_{2.5}$ standard was not enforced by Wyoming when this permit amendment application was submitted, nor is it currently applied to modeling of surface mine emissions. In addition, the old TSP standard has not been part of the state's monitoring requirements for more than 10 years (appendix F). Therefore, any discussion of particulate modeling in Wyoming is confined to PM_{10} emissions.

The permit revision request addressed the impacts associated with a proposed production increase to its current permitted level of 42 million tons per year and proposed improvements to mine facilities. These analyses considered all PM10 emission sources and included the neighboring Eagle Butte, Rawhide, Dry Fork, Wyodak, and Fort Union mines. The WDEQ/AQD approved the mine modification in Permit MD-1379, issued January 17, 2007. In its assessment of the modeling process, the agency noted that "…the applicant's dispersion modeling analyses were conducted using U.S. EPA approved models and methodologies, and the Division has reviewed and verified the source parameters, default settings, and related modeling inputs used in the applicant's modeling analyses. Through the required dispersion modeling analyses, the applicant has successfully demonstrated to the Division that all applicable air quality standards will be attained if the proposed changes in the applicant's mine plan and mining operations are approved" (WDEQ/AQD 2006). Based on WDEQ/AQD approval of this permit modification, Buckskin is not aware of any significant technical or modeling issues.

The maximum modeled impact from Buckskin and neighboring mines (including background) is about 80% of the NAAQS. The modeling analysis demonstrated that emissions from the permitted production level of 42 million tons per year would not cause or significantly contribute to exceedances of the NAAQS annual average. Buckskin's current production level of 25 million tons per year is expected to continue under the action alternatives considered in this EIS. A detailed description of the modeling process for this analysis is provided in appendix F.

As indicated, the recent modeling analysis was conducted for a maximum coal production rate of 42 million tons per year. Mining years 2011 and 2012 were selected as the projected "worst-case" based on Buckskin-specific and regional life-of-mine emission inventories for PM_{10} and NO_x. The highest model-predicted PM_{10} impact from Buckskin and neighboring mines during either year was 40.4 µg/m^3 (including a background concentration of 12 µg/m^3) compared to the annual WAAQS of 50 µg/m^3. Moreover, at the model receptor with highest predicted

cumulative impact, Buckskin's contribution was less than 1 µg/m^3. The maximum predicted contribution from Buckskin at any receptor was 16 µg/m^3. Given that the highest prediction for either worst-case year falls below the annual PM_{10} WAAQS, that standard is expected to be met throughout the life of the mine. Map 3.4-2 shows the modeled PM_{10} and NO_2 impacts at receptors located along the permitted Buckskin Mine boundary for 2011. Map 3.4-3 shows the same parameters for 2012. Both maps also depict the area sources used to model fugitive emissions.

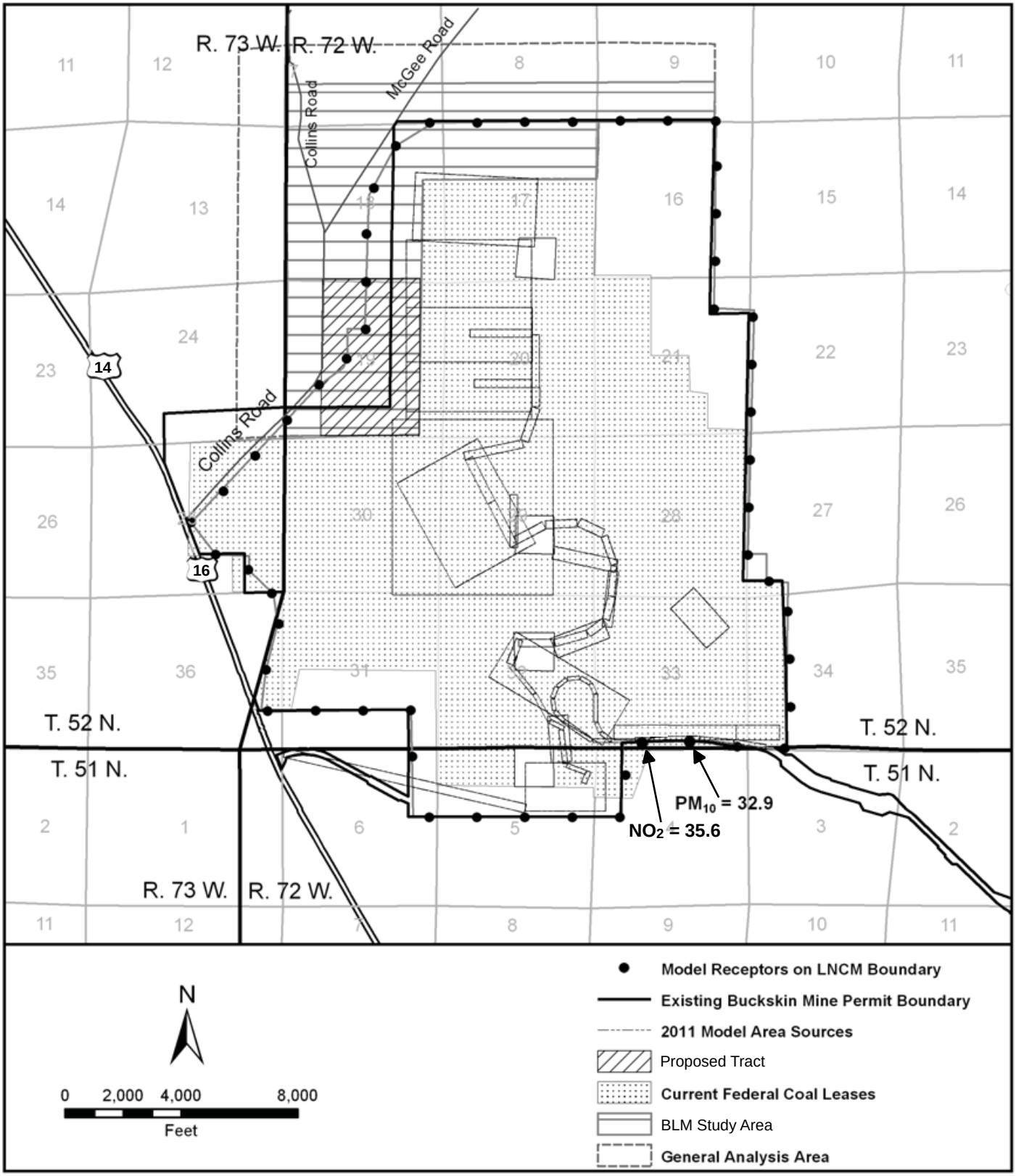
In addition to these modeling analyses, the Buckskin Mine also prepared a demonstration of short-term compliance with the 24-hour PM_{10} standard based on results from a single monitoring cycle as part of the 2006 air quality permit modification request. According to WDEQ/AQD policy (appendix F), a modeling analysis for short-term data was not required or conducted because the model tends to significantly over-predict 24-hour impacts of surface coal mines, and the agency therefore considers it to be an inaccurate representation of those impacts. Instead, the short-term compliance analysis focused on historical monitoring data and continuing employment of BACT on mine-wide emissions. That analysis again concluded that the 24-hour PM_{10} WAAQS would be protected throughout the life of the mine.

Fugitive emissions are the greatest emission source for surface coal mines in the Wyoming PRB. Such sources do not count against the PSD major source applicability threshold for incremental increases in criteria pollutants. Therefore, Buckskin and the other Wyoming PRB coal mines have not been subject to permitting under the PSD regulations because the mine emissions that are subject to PDS applicability levels fall below the allowable thresholds. Additional information regarding PSD requirements is provided in appendix F. Based on permits in place in the baseline year of 1997, when the Clean Air Act Amendments were enacted, only some fraction of the mine emissions included in the WDEQ/AQD air quality permit analyses contributes to the allowable increase (increment) in criteria pollutants in the region. Therefore, the concentrations predicted by the WDEQ/AQD air quality permit analyses should not be compared to PSD increments.

3.4.2.2 Environmental Consequences

Proposed Action

Under the Proposed Action, production would continue at the existing annual rate of 25 million tons. Because PM_{10} exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. As stated above, the $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Ongoing sources of particulate emissions would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis. Impacts on air quality from current facilities and mining techniques would be the same as those described above under "Affected Environment," but would continue for up to two years beyond the current life-of-mine estimate.



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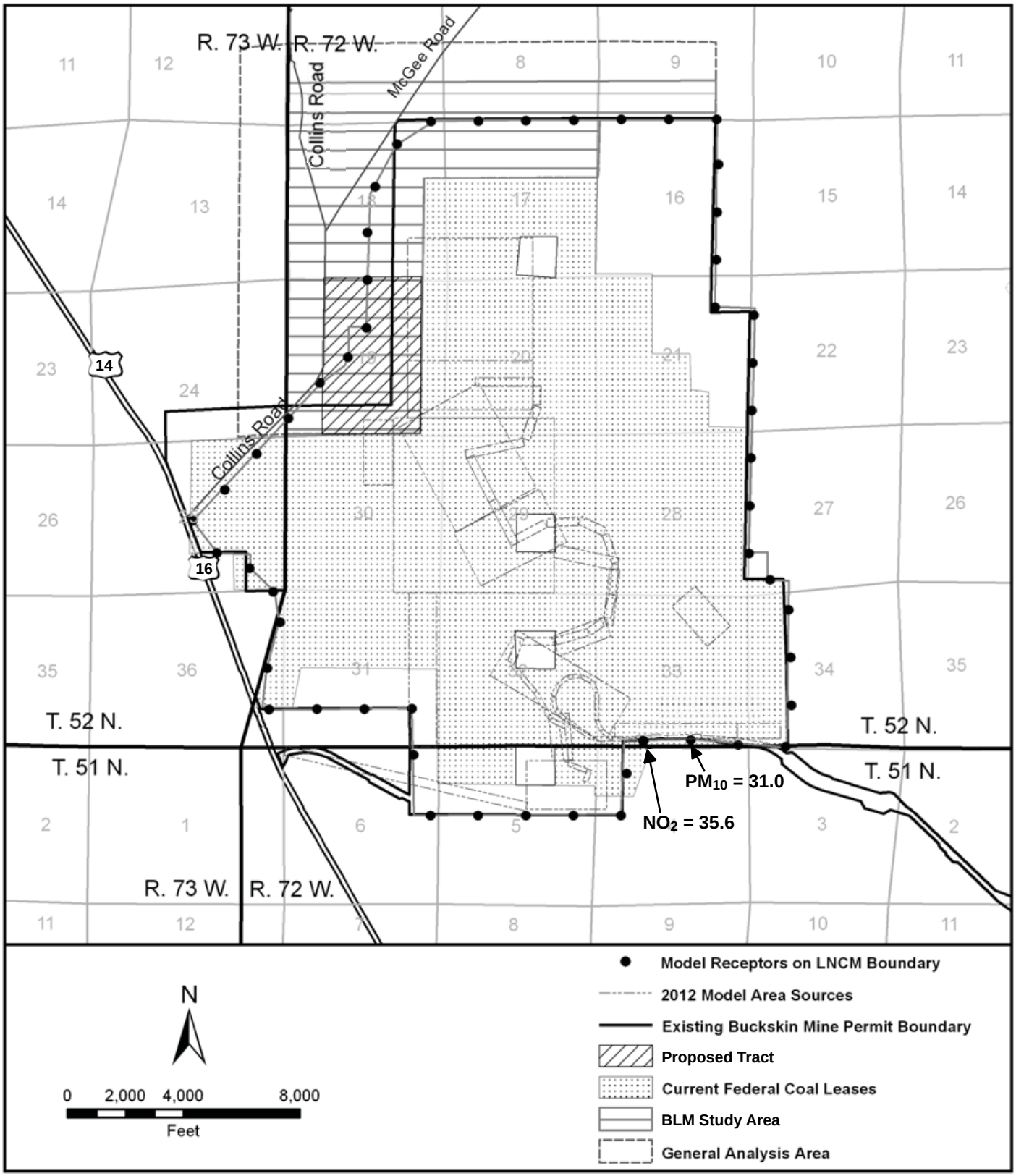
Map 3.4-2

2011 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary



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Map 3.4-3

2012 Maximum Modeled PM_{10} and NO_2 Concentrations for Buckskin Mine Ambient Air Boundary

Kiewit has no plans to change existing blasting procedures or sizes (section 1.1.3.3) when mining the proposed tract. Current BACT measures (section 3.4.2.3) for particulates would be employed. Coal haul rates and distances would not change significantly from current permitted levels, and all unpaved mine roads would continue to be treated for dust suppression.

Currently, no occupied residences are located within the proposed tract (maps 3.4-4A and 3.4-4B). The closest occupied dwellings are more than 0.5 mile from the proposed tract.

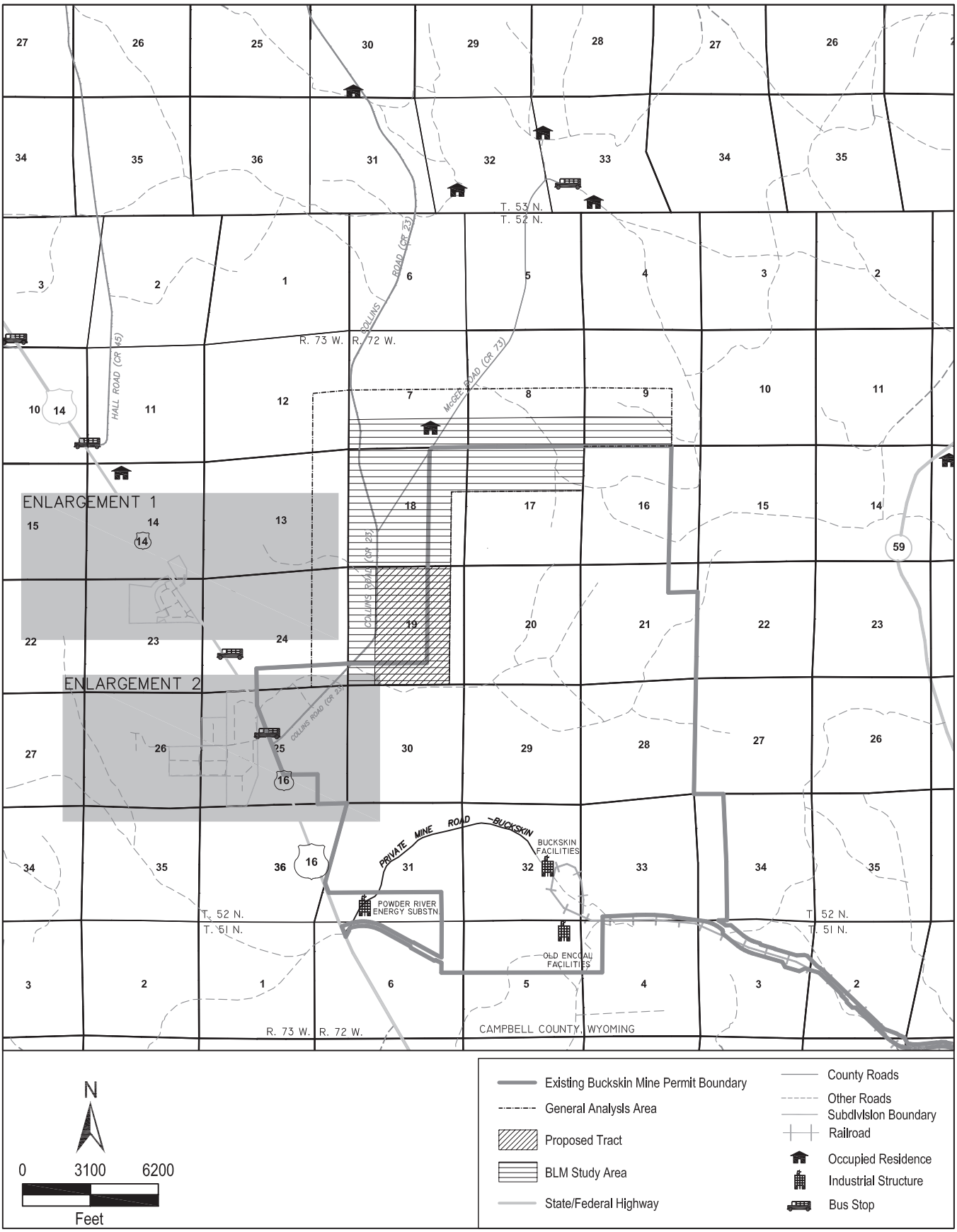
Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Production would continue at the existing annual rate of 25 million tons. Because PM_{10} exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. As stated above, the $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Particulate emissions generated in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would be associated with activities necessary to support mining on existing leases, described in section 1.1.3.3. Impacts on air quality from current facilities and mining techniques would be the same as those described above under "Affected Environment." Currently, no occupied residences are located in the overlap area; the only occupied dwelling within 1.5 miles of the overlap area is approximately 0.25 mile northwest (maps 3.4-4A and 3.4 4B). As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, production would continue at the existing annual rate of 25 million tons. Because PM_{10} exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this action alternative. As stated above, the $PM_{2.5}$ standard is not currently applied to modeling of surface mine emissions. Ongoing sources of particulate emissions would continue as a result of mining in up to 1,883 acres of the BLM study area, but would not be expected to increase on an annual basis. Details provided under the Proposed Action regarding blasting procedures and sizes, BACT measures, coal haul rates and distances, dust suppression, and modeled impacts and exceedances would be the same for this alternative. Impacts on air quality from current facilities and mining techniques would be the same as those described above under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

Currently, one occupied residence is located in the general analysis area (maps 3.4-4A and 3.4-4B). This residence is less than 0.25 mile from mining activities under existing mine operations. Therefore, this would not be a new impact under Alternative 2.



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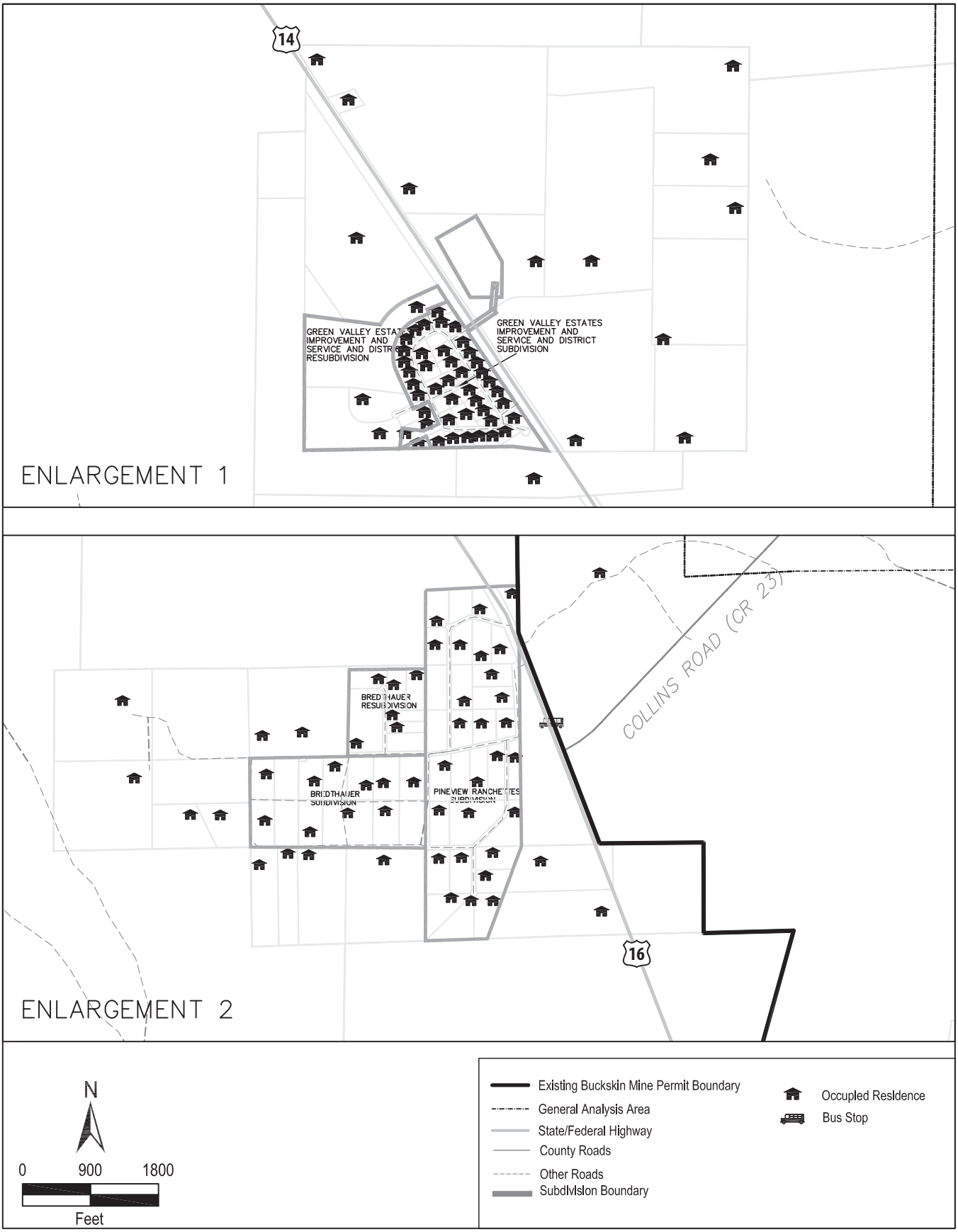
Map 3.4-4A

Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area



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Map 3.4-4B

Enlargement—Roads, Highways, Occupied Dwellings, Businesses, and School Bus Stops in the Vicinity of the General Analysis Area

3.4.2.3 Regulatory Compliance, Mitigation, and Monitoring

Before any mining could begin under the action alternatives, Buckskin would need an air quality permit modification from the WDEQ/AQD and would need to conduct new air quality modeling in support of that application demonstrating ongoing compliance with all applicable ambient standards. Control of point and fugitive sources of particulates and emissions at all PRB coal mines is accomplished with a variety of measures described in section 1.1.3.3. For example, emissions at coal crushing, storage, and handling facilities (point sources) are controlled with baghouse dust collection systems, passive enclosure controls, or atomizers/foggers. These are all considered BACTs by the WDEQ/AQD.

Fugitive emissions are also controlled with a variety of other BACT measures. For example, mine access roads have been paved and water trucks are used to apply water and chemical dust suppressants on all haul roads used by trucks and/or scrapers. Haul truck speed limits are imposed to further help reduce fugitive emissions from roads. Material drop heights for shovels and draglines (bucket to truck bed or backfill) are limited to the minimum necessary to conduct the mining operations. Timely revegetation of disturbed areas is used to minimize wind erosion. Fugitive emissions from the coal truck dumps are controlled with stilling sheds. All of these control measures are employed at the Buckskin Mine, including the following additional mining practices and equipment.

- Scoria is distributed on haul roads to further reduce fugitive dust; scoria is comprised of baked and fused rock resulting from natural in-place burning of coal deposits.
- Crushed scoria spread on paved access roads for traction during winter is swept and collected, as necessary.
- Operating baghouses are inspected daily and observed malfunctions are immediately corrected.
- Storage silos and loadout silos are used to contain coal awaiting shipment from the Buckskin Mine coal preparation plant.
- A retractable chute minimizes drop height when loading rail cars.
- Windrows are bladed in pit advance areas that have been stripped of topsoil.
- Topsoil stockpiles and sediment-control structures are seeded immediately.
- Coal fires are promptly extinguished.

The WDEQ/AQD is continually reviewing the data and considering regulatory options, such as increasing the frequency of monitoring. Continuous PM_{10} monitoring is now required at many PRB mines, including Buckskin. Other regulatory options may include enforcement actions such as notices of violation resulting in a consent decree and/or modified permit conditions. The WDEQ/AQD is also coordinating with the EPA to develop additional monitoring requirements in CBNG development areas, high PM_{10} mitigation action plans in permits, and additional mitigation measures under the SIP.

In April, 2006, the WDEQ in a joint effort with PRB mining stakeholders developed a detailed NEAP for the coal mines of Campbell and Converse counties, Wyoming. The NEAP was developed under the framework afforded by EPA's Natural Events Policy of May 30, 1996. Buckskin is complying with the NEAP developed jointly by the WDEQ/AQD and the PRB coal operators.

The NEAP recognizes that certain NAAQS exceedances due to natural events are uncontrollable. While all practical mitigation measures need be implemented during those events, exceedances attributable to natural events should not be considered against the NAAQS attainment designation for the region. Specific NEAP goals include:

- Provide for the protection of public health.
- Develop a public information program.
- Provide a mechanism for "flagging" exceedances due to uncontrollable natural events.
- Implement best available control measures and reasonably available control measures based on the severity of the event.
- Provide a mechanism for excluding flagged data when they meet specific wind speed criteria and best available and reasonably available control measures are in place.

The PRB mining operators had already implemented these measures for several years when formal approval of the NEAP was received from EPA Region VIII in 2007.

Through the end of 2001, at minimum, each mine monitored air quality for a 24-hour period every six days at multiple monitoring sites. More recently, monitoring has occurred at active mines for a 24-hour period every three days, with some mines (including Buckskin) conducting continuous monitoring.

Numerous monitors are also located in Sheridan, Gillette, Arvada, and Wright, Wyoming. The extensive air quality monitoring network currently in use enables the WDEQ/AQD to manage the air resource using monitoring data rather than modeled predictions. The agency also uses monitoring stations located elsewhere in the state to anticipate issues related to air quality throughout Wyoming. These monitoring stations are located to measure ambient air quality rather than impacts from a specific source.

Monitors located to measure impacts from a specific source may be used to establish trends. These data are used to proactively arrest or reverse trends towards air quality problems. When the WDEQ/AQD became aware that particulate readings in the PRB were increasing due to increased CBNG activity and prolonged drought, the agency approached the counties, coal mines, and CBNG industry. A coalition involving those entities has made significant efforts towards minimizing dust from graded roads. Measures taken have ranged from implementing speed limits to paving heavily traveled roads. As a participant in this program, the Buckskin Mine has periodically applied magnesium chloride to two county roads (Collins Road and McGee Road) and a secondary access road. All of these measures are believed to have reduced the impacts of nearby, non-mining activity on Buckskin's monitors.

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

3.4.3 Emissions of Nitrogen Oxides and Ozone

3.4.3.1 Affected Environment

Gases that contain nitrogen and oxygen in varying amounts are referred to as nitrogen oxides, or NO_x. One type of NO_x is NO_2, a reddish-brown gas that is heavier than air and has a pungent odor. NO_2 is by far the most toxic of this group and can combine with atmospheric moisture to form nitric acid and nitric oxide. Because several NO_x species can be chemically converted to NO_2 in the atmosphere, NO_2 emissions control is focused on all NO_x gases, while the ambient standard is expressed in terms of NO_2.

NO_x forms when fuel is burned at high temperatures either naturally or by human activities. The primary direct source of NO_x emissions during coal mining operations is tailpipe emissions from mining equipment and other vehicle traffic inside the mine permit area. Blasting that is done to remove overburden can result in emissions of several products, including NO_2, because of the incomplete combustion of explosives used in the blasting process. When this occurs, gaseous, orange-colored clouds may be formed, and they can drift or be blown off mine permit areas. The rate of release is not well known but is believed to depend on a wide number of factors which include, but are not necessarily limited to: downhole confinement; downhole moisture; type/blend of ammonium nitrate, fuel oil, and emulsion; and detonation velocity.

Various compounds and derivatives in the NO_x family, including NO_2, nitric acid, nitrous oxide, nitrates, and nitric oxide, may cause a wide variety of health and environmental impacts. According to the EPA (EPA 2007a), the following are the main causes of concern with respect to NO_x:

- It is one of the main precursers involved in the formation of ground-level 0_3, which can trigger serious respiratory problems.
- It reacts to form nitrate particles, acid aerosols, as well as NO_2, which also cause respiratory problems; and affects air quality related values (AQRVs) of visibility and deposition.
- It contributes to the formation of acid rain.
- It contributes to nutrient overload that deteriorates water quality.
- It contributes to atmospheric particles that cause visibility impairment, most noticeably in national parks.
- It reacts to form toxic chemicals.
- Nitrous oxide is a greenhouse gas that contributes to climate change.

- It can be transported over long distances.

That agency also associates the following severe health risks specifically with NO_2 (EPA 2001a):

- It may cause significant toxicity because of its ability to form nitric acid with water in the eye, lung, mucous membranes, and skin.
- Acute exposure may cause death by damaging the pulmonary system.
- Chronic or repeated exposure to lower concentrations of NO_2 may exacerbate pre-existing respiratory conditions, or increase the incidence of respiratory infections.

Potential health risks associated with inhalation of ground-level 0_3 and NO_x related particles include acute respiratory problems, aggravated asthma, decreases in lung capacity in some healthy adults, inflammation of lung tissue, respiratory-related hospital admissions and emergency room visits, and increased susceptibility to respiratory illnesses, including bronchitis and pneumonia (EPA 2007b). The WDEQ/AQD has received no reports of public exposure to NO_2 from blasting activities conducted at the Buckskin Mine. Therefore, the agency has not required Buckskin to implement any specific measures to control or limit public exposure to NO_2 from blasting, such as restrictions regarding blasting size, setbacks, or other parameters.

Although no NAAQS or WAAQS regulate short-term NO_2 levels, concern does exist about the potential health risk associated with short-term exposure to NO_2 from blasting emissions. The National Institute for Occupational Safety and Health (NIOSH) (NIOSH 2005), the Occupational Safety and Health Administration (OSHA) and the EPA have identified the following short-term exposure criteria for NO_2:

- NIOSH's recommended "immediately dangerous to life and health" level is 20.0 parts per million (37,600 $\mu g/m^3$).
- EPA's "significant harm" level, a 1-hour average, is 2.0 parts per million (3,760 $\mu g/m^3$).
- OSHA's "short-term exposure limit," a 15-minute time weighted average, which was developed for workers, is 5.0 parts per million (9,400 $\mu g/m^3$, which must not be exceeded during any part of the workday, as measured instantaneously).
- NIOSH's recommendation for workers is a limit of 1.0 parts per million (1,880 $\mu g/m^3$) based on a 15-minute exposure that should not be exceeded at any time during the workday.
- EPA recommends that concentrations not exceed 0.5 parts per million (940 $\mu g/m^3$) for a 10-minute exposure to protect sensitive members of the public (EPA 2003a).

A study conducted by Dr. Edward Faeder for the Black Thunder Mine recommended a limit of 5.0 parts per million (9,400 $\mu g/m^3$) for a 10-minute exposure.

According to EPA, "The exact concentrations at which NO_2 will cause various health effects cannot be predicted with complete accuracy because the effects are a function of air concentration and time of exposure, and precise measurements have not been made in association with human toxicity. The information that is available from human exposures also suggests that there is some variation in individual response" (EPA 2001a).

Many mines in the PRB have implemented procedures aimed at reducing the amount of NO_x, particularly NO_2, released from the incomplete combustion of blasting agents; blasting NO_x is most often associated with cast blasting, which is used at larger mines with dragline operations. Because blast clouds are of a short-term, transient nature, the level of short-term exposure deemed to be "safe" is unknown. While this issue remains the subject of great debate, it should be noted that neither the EPA nor WDEQ/AQD has established NAAQS for NO_2 for averaging times shorter than one year. Despite extensive expert testimony provided to the Wyoming Environmental Quality Commission during hearings conducted in 2002 that argued for the establishment of a de facto "standard" ranging from 0.5 to 5.0 parts per million for a 10-minute exposure, the agency determined that insufficient evidence was available to establish a short-term exposure limit and concluded that additional study was required.

On the order of the Director of the WDEQ, members of the mining industry in the PRB conducted a comprehensive, multi-year monitoring and modeling study of NO_2 exposures from blast clouds. Based on results from that study (Thunder Basin Coal Company 2002) and supplemental data collected at the Buckskin Mine and elsewhere in the PRB, a series of "safe" setback curves for coal, overburden, and cast shots for various wind speed classes was derived from the sampled data, conservative projections of concentrations at greater/lesser distances than measured, and an assumed safe level (based on a comprehensive review of available health effects data) of 5.0 parts per million for 10 minutes. Appendix F provides additional details about this study and the data collection process.

Thus, while disagreement still exists regarding acceptable exposure levels, a large amount of actual data is now available from which informed decisions can be made regarding blasting practices. Regardless of the outcome of the debate on the allowable exposure level, the data show clearly that reduction in blast size and increases in setback distances are effective methods for mitigating the frequency and extent of public exposures.

Public exposure to emissions caused by surface mining operations is most likely to occur along public roads and highways that pass through the area of the mining operations. Occupants of dwellings in the area could also be affected. Sources of fugitive NO_x emissions at the Buckskin Mine include the tailpipe emissions from the mining equipment, emissions from the trains used to haul the coal from the mine, and blasting the overburden and coal to facilitate excavation. As described in section 1.1.3.3, the Buckskin Mine does not use cast blasts to move overburden, though other blasting techniques are used in this process. Although all blasting methods have some potential for NO_x emissions, cast blasts are the most likely source. No NO_x point sources occur at the mine**.**

The WDEQ/AQD has determined that an assessment of annual NO_x impacts must be included as part of an air quality permitting analysis for new surface coal mines and existing mine plan revisions. The potential NO_x emissions related to mining operations at the existing Buckskin Mine are described in the air quality permit application submitted to the WDEQ/AQD in June 2006; the purpose of the permit revision request was described in section 3.4.2.1.

NO_x modeling was conducted in support of that June 2006 air permit application. Mining sources of NO_x were modeled as fugitive emissions from the areas where mining activities were projected to occur at Buckskin and the other five mines in the northern PRB. These included the overburden and coal blasting emissions, mobile emissions, and stationary emissions described in section 3.4.1.3. Regional sources of NO_x were also modeled, including local power plants, gas compressor stations, railroads, highways, and the City of Gillette. Individual and combined impacts from Buckskin, the other northern mines, and regional sources were evaluated at all model receptors. These receptors were placed around the perimeter of the northern group of mines and outward in a rectangular grid with 500-meter spacing. The extent of the receptor grid was sufficient to encompass the area of significant NO_x impact from the Buckskin Mine (1.0 $\mu g/m^3$ or more).

NO_2 impacts were derived by multiplying modeled NO_x concentrations by 75% and adding a background NO_2 concentration of 14 $\mu g/m^3$. This approach followed 40 CFR Part 51, Section 6.2.3, appendix W of the EPA's Guideline on Air Quality Models. The background NO_2 concentration was based on WDEQ/AQD guidance and ambient NO_x monitoring results at the Foundation Coal's Belle Ayr Mine in 2001 and 2002; that mine is approximately 20 miles southeast of the Buckskin Mine. Additional descriptions of the modeling process for this analysis is provided in appendix F.

Maximum annual NO_2 impacts (including regional sources and background concentration) at any model receptor of 38.0 $\mu g/m^3$ and 37.8 $\mu g/m^3$ were predicted in 2011 and 2012 respectively. Both of those values were considerably lower than the annual NO_2 NAAQS of 100 $\mu g/m^3$. At the model receptor where these predicted maximum values were calculated, Buckskin's contributions were estimated at 1.6 $\mu g/m^3$ in 2011 and 1.8 $\mu g/m^3$ in 2012. This receptor is located in an area impacted primarily by neighboring mines. A background NO_2 concentration of 14 $\mu g/m^3$ was assumed based on WDEQ/AQD guidance and ambient NO_x monitoring results at the Belle Ayr Mine in 2001 and 2002. Maps 3.4-2 and 3.4-3 show maximum modeled impacts at the Buckskin Mine boundary receptors of 35.6 $\mu g/m^3$ and 35.7 $\mu g/m^3$ in 2011 and 2012, respectively. Because modeled impacts from the worst-case years fall well below the NAAQS, the NO_2 NAAQS will be protected throughout the life of the mine.

O_3 has the same chemical structure whether it occurs miles above the earth or at ground-level and can be "good" or "bad," depending on its location in the atmosphere. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents as well as natural sources emit NO_x and volatile organic compounds that help form O_3. In the earth's lower atmosphere, ground-level O_3 is considered "bad." Ground-level O_3 is the primary constituent of smog. Sunlight and hot weather cause ground-level O_3 to form in harmful concentrations in the air. As a result, it is known as a summertime air pollutant. Many urban areas tend to have high levels of "bad" O_3, but even rural areas are also subject to increased O_3 levels because wind carries O_3 and the pollutants that form it hundreds of miles away from their original sources.

Under the CAA, the EPA has set protective health-based standards for O_3 in the air we breathe. Prior to May 27, 2008, the NAAQS 8-hour standard for O_3 was 0.080 parts per million

(157 μg/m^3). On March 27, 2008 (effective May 27, 2008) the EPA revised the 8-hour standard to 0.075 parts per million (147 μg/m^3). The WDEQ/AQD does not require O_3 monitoring at the Buckskin Mine, but levels have been monitored at WDEQ/AQD operated and maintained ambient air quality monitor sites in the PRB since 2001 (appendix F). An exceedance of the O_3 8-hour standard occurs if the 4th-highest daily maximum value is above the level of the standard (0.08 parts per million prior to 2008 and 0.075 parts per million since 2008). No exceedances of the O3 standard have occurred at either of the two monitoring sites when evaluated under the standard in place at the time the values were recorded.

3.4.3.2 Environmental Consequences

Proposed Action

Under the Proposed Action, production would continue at the existing annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. Ongoing sources of short-term NO_x emissions would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis. Impacts on air quality from current mining equipment and techniques would be the same as those described above under "Affected Environment," but would continue for up to two years beyond the current life-of-mine estimate.

Kiewit has no plans to change blasting procedures or sizes (section 1.1.3.3) when mining the proposed tract. Current control and notification measures for NO_x emissions (section 3.4.3.3) would continue to be employed.

Currently, no occupied residences are located within the proposed tract (maps 3.4-4A and 3.4-4B). The closest dwellings are more than 0.5 mile from the proposed tract.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Production would continue at the existing annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this alternative. Sources of NO_x emissions (e.g, vehicles, blasting [not cast-blasting]) in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would be associated with activities necessary to support mining on existing leases, described in section 1.1.3.3. Impacts on air quality from current facilities and mining techniques would be the same as those described above under "Affected Environment." Currently, no occupied residences are located in the overlap area; the only occupied dwelling within 1.5 miles of the overlap area is approximately 0.25 mile northwest (maps 3.4-4A and 3.4 4B). As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, production would continue at the existing annual rate of 25 million tons. Because NO_x exceedances were not forecast under the existing permit for 42 million tons per year, no exceedances are anticipated under this action alternative. Ongoing sources of short-term NO_x emissions would continue as a result of mining in up to 1,883 acres of the BLM study area, but would not be expected to increase on an annual basis. Impacts on air quality would be the same as those described above under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

Details provided under the Proposed Action regarding blasting procedures and sizes, BACT measures, coal haul rates and distances, dust suppression, and modeled impacts and exceedances would be the same for this alternative. Kiewit has no plans to change blasting procedures or sizes associated with the mining in the BLM study area. Current control and notification measures for NO_x emissions would continue to be employed.

Currently, one occupied residence is located in the general analysis area (maps 3.4-4A and 3.4-4B). This residence is less than 0.25 mile from mining activities under existing mine operations. Therefore, this would not be a new impact under Alternative 2.

3.4.3.3 Regulatory Compliance, Mitigation, and Monitoring

Before any mining of the proposed tract could begin, the Buckskin Mine would need an air quality permit modification from the WDEQ/AQD and would need to conduct new air quality modeling in support of that application demonstrating ongoing compliance with all applicable ambient standards.

As described in section 3.4.3.2, the WDEQ/AQD has received no reports of public exposures to NO_2 from blasting activities conducted at the Buckskin Mine; therefore, the agency has not required the mine to implement any specific measures to control or limit public exposure to mine emissions. Additionally, the mine does not use cast blasts to move overburden; that is the most common source of the NO_2 clouds of greatest concern to local residents. Nevertheless, Buckskin has voluntarily committed to employ a variety of notification and control measures associated with blasting emissions in a good faith effort to keep the public informed of blasting activities. Several other surface coal mines in the PRB use similar voluntary blasting notification and control measures to avoid NO_2 impacts on the public.

Voluntary measures that have been instituted at Buckskin (and other mines), particularly when large blasts are planned, include:

- notifying neighbors by telephone (both private parties and other mining operations) in the general area of the mine prior to large blasts;
- monitoring weather and atmospheric conditions prior to the decision to detonate a large blast;
- minimizing blast size to the extent possible;

- posting signs on major public roads that enter the general mine area and on all locked gates accessing the active mine area;
- closing public roads that enter the general mine area, depending on wind conditions and blast location with respect to the road; and
- providing post-blast notification to neighbors of potential exposure to the blasting cloud.

The WDEQ/AQD has required several mines, including the neighboring Eagle Butte and Wyodak mines (map 1-1), to stop traffic on adjacent state and U.S. highways during blasting due to concerns with fly rock and the "startle factor." The agency does not require the Buckskin Mine to stop traffic because the blasting area does not affect any major public roads.

NO_2 was monitored in Gillette from 1975 through 1983. Because of public concerns about NO_2 emissions from blasting (particularly cast blasts) and a general concern by the WDEQ/AQD about levels of NO_x from all types of development in the PRB, the coal mining industry instituted a monitoring network in cooperation with the agency to gather data on those emissions beginning in 2001. Additional monitoring was conducted throughout the PRB from 2003 to 2006. Details regarding funding and ownership of the coal monitoring program are provided in appendix F.

The results of the most recent NO_x monitoring are summarized in table 3.4-4. The results indicate annual average NO_2 concentrations at all sites are well below the NAAQS of 100 µg/m^3 (table 3.4-1). The WDEQ/AQD and respective mines maintain these monitoring stations, and the agency relies on the ongoing monitoring data and emission inventories in air quality permit applications to demonstrate compliance with the annual NO_2 ambient air standard.

Table 3.4-4. Annual Ambient NO_2 Concentration Data (µg/m^3)

Year	Antelope Mine	Belle Ayr Mine	Thunder Basin National Grassland	Campbell Co.	Tracy Ranch
2003	7.5	13.2	5.6	13.2	
2004	2.9	10.3	3.8	9.4	5.5
2005	5.5	9.5	8.4	7.5	7.2
2006	5.1	14.4	8.1	5.7	11.2
2007			3.8	7.5	6.9

µg/m^3 = micrograms per cubic meter; NO_2 = nitrogen dioxide
Source: EPA 2009a

3.4.4 Visibility

Visibility refers to the clarity with which scenic vistas and landscape features are perceived at great distances. Visibility can be defined as the distance one can see and the ability to perceive color, contrast, and detail. $PM_{2.5}$ is the main cause of visibility impairment. Visual range, one of several ways to express visibility, is the farthest distance from which a person can see a

landscape feature. Without the effects of human-caused air pollution, a natural visual range is estimated to be about 140 miles in the western part of the U.S. and 90 miles in the eastern part (EPA 2001b). Presently, the visibility conditions monitored in the Bridger Wilderness Area are among the best in the U.S.

Visibility impairment is expressed in terms of deciview (dv). The dv index was developed as a linear perceived visual change (Pitchford and Malm 1994), and is the unit of measure used in the EPA's regional haze rule to achieve the national visibility goal. This goal was established as part of the CAA to prevent any future, and remedy any existing, impairment of visibility in mandatory federal class I areas that result from human-caused air pollution. The dv index is a scale related to visual perception that has a value near zero for a pristine atmosphere. A change in visibility of 1.0 dv represents a "just noticeable change" by an average person under most circumstances. Increasing dv values represent proportionately larger perceived visibility impairment.

3.4.4.1 Affected Environment

Air quality related values, including the potential air pollutant effects on visibility, are applied to PSD Class I (e.g., national parks) and Class II (areas outside designated Class I zones) areas; those classifications are described in section 2.3 of appendix F. The land management agency responsible for the Class I area (most restrictive) sets a limit of acceptable change for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Table 3.4-5 shows approximate distances and directions from the general analysis area to 31 PSD Class I and sensitive Cass II areas in the vicinity of the PRB.

Table 3.4-5 Distances and Directions from the General Analysis Area to Sensitive Air Quality Areas

	Distance (miles)	Direction to Receptor
MANDATORY FEDERAL PSD CLASS I AREA		
Badlands Wilderness Area[1]	165	ESE
Bridger Wilderness Area	225	WSW
Fitzpatrick Wilderness Area	215	WSW
Gates of the Mountain Wilderness Area	343	NW
Grand Teton National Park	265	WSW
North Absaroka Wilderness Area	210	WNW
Red Rocks Lake Wilderness Area	307	W
Scapegoat Wilderness Area	393	NW
Teton Wilderness Area	237	WSW
Theodore Roosevelt National Park (North Unit)	242	NNE
Theodore Roosevelt National Park (South Unit)	196	NNE
U.L. Bend Wilderness Area	287	NW
Washakie Wilderness Area	215	WSW
Wind Cave National Park	123	SE

	Distance (miles)	Direction to Receptor
Yellowstone National Park	236	W
TRIBAL FEDERAL PSD CLASS I		
Fort Peck Indian Reservation	252	N
Northern Cheyenne Indian Reservation	74	NNW
FEDERAL PSD SENSITIVE CLASS II		
Absaroka-Beartooth Wilderness Area	219	WNW
Agate Fossil Beds National Monument	168	SSE
Bighorn Canyon National Recreation Area	137	WNW
Black Elk Wilderness Area	113	ESE
Cloud Peak Wilderness Area	81	W
Crow Indian Reservation	120	NW
Devils Towner National Monument	42	ENE
Fort Belknap Indian Reservation	316	NNW
Fort Laramie National Historic Site	164	SSE
Jewel Cave National Monument	117	ESE
Mount Rushmore National Memorial	112	ESE
Popo Agie Wilderness Area	208	SW
Soldier Creek Wilderness Area	197	SE

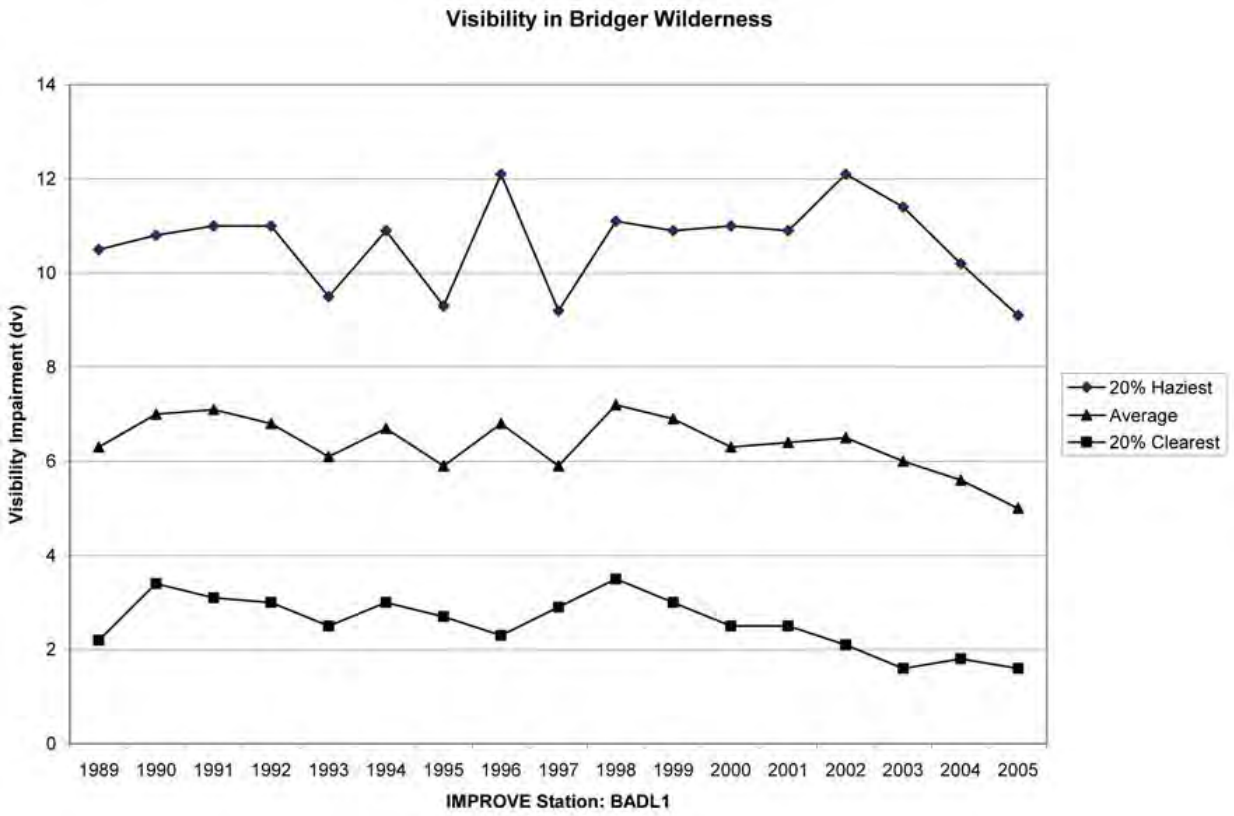
PSD = prevention of significant deterioration of air quality

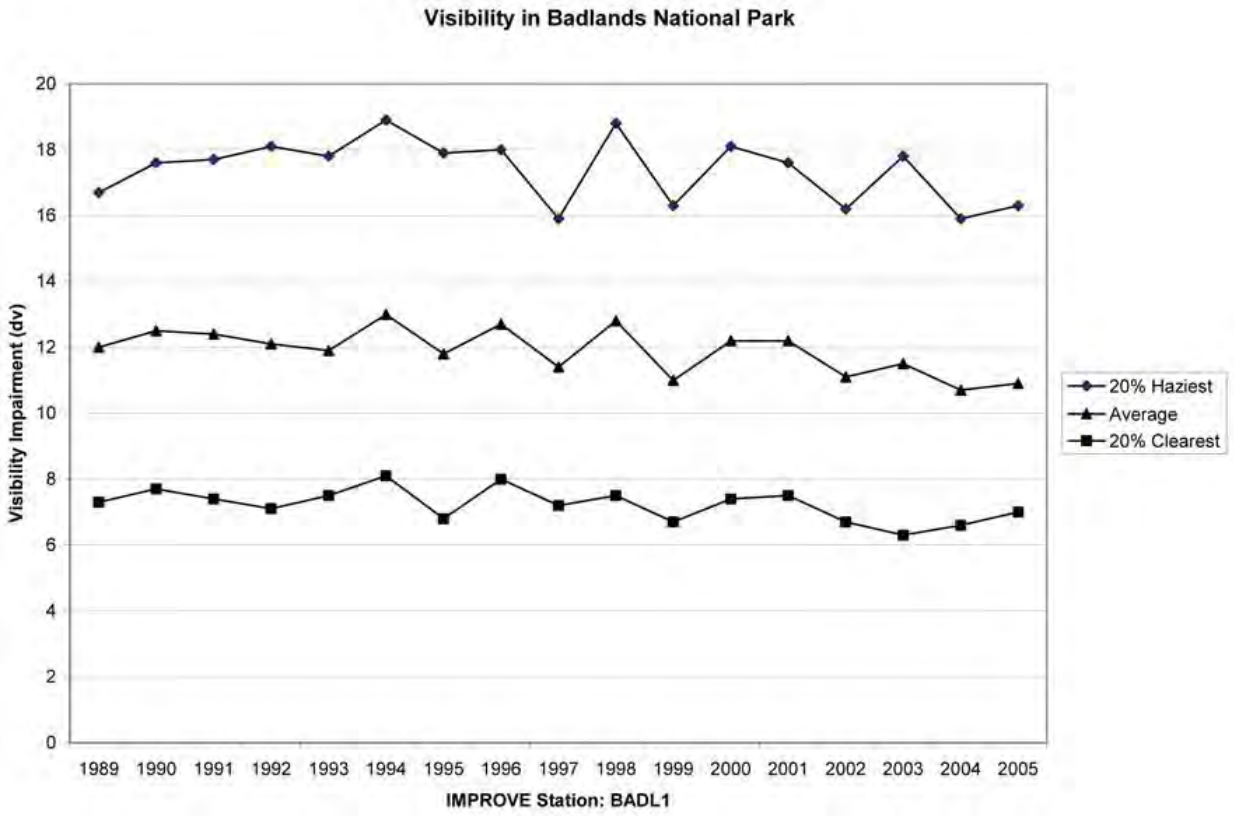
[1] The U.S. Congress designated the wilderness area portion of Badlands National Park as a mandatory federal PSD class I area. The remainder of Badlands National Park is a PSD class II area.

The regional haze rule calls for improved visibility on the most impaired days and no additional impairment on the least impaired days (EPA 1999). The EPA participates in the Interagency Monitoring of Protected Visual Environments (IMPROVE) visibility monitoring program as part of its visibility protection program. The IMPROVE monitoring sites were established to be representative of all Class I areas. Figure 3.4-2 shows annual averages for the 20% best, average, and worst visibility days in the Badlands and Bridger wilderness areas from 1989 through 2005. To date, the Badlands National Park has statistically shown improved visibility on the least impaired days and no change in visibility on the average and most impaired days. The Bridger Wilderness Area has shown no statistically significant change in visibility on the least, average, or most impaired days (IMPROVE 2005).

The *Wyoming State Implementation Plan for Class I Visibility Protection* states “Wyoming’s long term strategy will focus on the prevention of any future visibility impairment in Class I areas that can be attributed to a source or small group of sources as the federal land managers have not identified any current impairment in the state’s Class I areas due to such sources” (WDEQ/AQD 2003). The report is available at http://deq.state.wy.us/aqd/visibility.asp.

Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ/AQD Rules and Regulations (Chapter 6, Section 4). Therefore, State of Wyoming does not require mines to evaluate their impacts on class I areas, though the BLM does consider such issues during leasing.





No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.4-2

Visibility in the Badlands National Park and Bridger Wilderness Area

3.4.4.2 Environmental Consequences

Proposed Action

Under the Proposed Action, production would continue at the existing annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, no new significant changes in visibility are anticipated under this alternative. Ongoing sources of impacts on visibility would continue as a result of mining the proposed tract, but would not be expected to increase on an annual basis. Impacts on visibility would be the same as those described above under "Affected Environment," but would continue for up to two years beyond the current life-of-mine estimate.

Kiewit has no plans to change blasting procedures or sizes associated with the mining the proposed tract. Coal haul rates and distances would not change significantly from current permitted levels and all unpaved mine roads would continue to be treated for dust suppression. Current BACT measures for particulates (outlined in section 3.4.2.3) that could contribute to impaired visibility would continue to be employed.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Production would continue at the existing annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, no new significant changes in visibility are anticipated under this alternative. Impacts on visibility generated in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would be associated with activities necessary to support mining on existing leases, described in section 1.1.3.3. Impacts on air quality from current facilities and mining techniques would be the same as those described above under "Affected Environment." As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, production would continue at the existing annual rate of 25 million tons. Because visibility has improved or remained relatively unchanged under the existing permit for 42 million tons per year, no new significant changes in visibility are anticipated under this alternative. Ongoing sources of particulate emissions would continue as a result of mining in up to 1,883 acres of the BLM study area, but would not be expected to increase on an annual basis. Impacts on visibility from current facilities and mining techniques would be the same as those described above under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

Kiewit has no plans to change blasting procedures or sizes associated with the mining the proposed tract. Coal haul rates and distances would not change significantly from current permitted levels and all unpaved mine roads would continue to be treated for dust suppression.

Current BACT measures for particulates (outlined in section 3.4.2.3) that could contribute to impaired visibility would continue to be employed.

3.4.4.3 Regulatory Compliance, Mitigation, and Monitoring

As discussed in section 3.4.2.1 and section 3.4.3.1, $PM_{2.5}$ is the main cause of visibility impairment from coal mining operations, with secondary impacts from NO_x emissions. Mitigation measures in use to limit emissions of particulate matter are discussed in section 3.4.2.3 and NO_x mitigation measures are discussed in section 3.4.3.3. Additional information is provided in appendix F.

Visibility monitoring in Wyoming consists of both the WDEQ/AQD-sponsored Wyoming visibility monitoring network and the IMPROVE program. The WDEQ/AQD has sited two visibility-monitoring stations in the PRB. The Thunder Basin National Grasslands site is 32 miles north of Gillette and the Cloud Peak Wilderness Area site is 14 miles west of Buffalo (approximately 84 miles west of Gillette). Both sites include a variety of sophisticated monitoring equipment, as described in section 3.0 of appendix F. These sites are being used to characterize the extent, frequency of occurrence, and magnitude of impairments to visual air quality.

The IMPROVE steering committee approved the incorporation of the Thunder Basin and Cloud Peak sites into the IMPROVE network in June 2002. Although these stations are not located in Class I areas, the collected data will be comparable to monitoring data available from such areas elsewhere in the state. This information can help scientists determine the types and concentrations of air pollutants and their direction of travel in order to project visibility impacts on Class I areas. The Wyoming visibility monitoring network was recently supplemented with the development of a website at http://www.wyvisnet.com/all.html to allow public access to real-time monitored visibility and air quality conditions (WDEQ/AQD 2005).

3.4.5 Acidification of Lakes

Lake acidification is the change in acid-neutralizing capacity, or the lake's capacity to resist acidification. The acidification of lakes and streams is caused by atmospheric deposition of pollutants (acid rain). According to the EPA, SO_2 and NO_x are the main causes of acid rain (EPA 2009b); both elements are primarily derived from burning fossil fuels. Most lakes and streams have a pH between 6 and8 (on a scale of 1 to 14), although some lakes are naturally acidic even without the effects of acid rain. Acid rain primarily affects sensitive water bodies located in watersheds whose soils have a limited ability to neutralize acidic compounds (called "buffering capacity"). Lakes and streams become acidic (i.e., pH value goes below 7) when the water itself and its surrounding soil cannot buffer the acid rain enough to neutralize it. In areas where buffering capacity is low, acid rain also releases aluminum from soils into lakes and streams; aluminum is highly toxic to many species of aquatic organisms.

Several regions in the U.S. were identified in a national surface water survey as containing many of the waters sensitive to acidification. They include the Adirondacks and Catskill mountains in

New York, the mid-Appalachian highlands along the east coast, the upper Midwest, and mountainous areas of the western U.S.

Scientists predict that the decrease in SO_2 emissions required by a nationwide acid rain program will significantly reduce acidification due to atmospheric sulfur. Without the reductions in SO_2 emissions, the proportions of acidic aquatic ecosystems would remain high or dramatically worsen (EPA 2005a). The USDA Forest Service has been monitoring air quality in the Wind River Mountain Range in Wyoming since 1984 and is seeing a general trend of decreasing sulfates. In contrast, nitrates have been increasing globally.

3.4.5.1 Affected Environment

AQRVs, including the potential air pollutant effects on the acidification of lakes and streams, are applied to PSD Class I and Class II areas. The land management agency responsible for the Class I area in a particular region sets limits of acceptable change for each AQRV. The AQRVs reflect the land management agency's policy and are not legally enforceable standards. Lake acidification is expressed as the change inacid-neutralizing capacity, which represents the lake's capacity to resist acidification from acid rain. This unit of change is measured in microequivalents per liter. Table 3.4-6 shows the existing acid-neutralizing capacity monitored in some mountain lakes in Wyoming and their distance from the general analysis area. For comparison, the USDA Forest Service considers lakes with acid-neutralizing capacity values between 25 and 100 microequivalents per liter to be very sensitive to atmospheric deposition, and lakes with values less than or equal to 25 microequivalents per liter to be extremely sensitive to atmospheric deposition.

Table 3.4-6. Existing Acid-Neutralizing Capacity in Sensitive Lakes

Wilderness Area	Lake	Background Acid-Neutralizing Capacity (µeq/L)	Distance from General Analysis Area (miles)
Bridger	Black Joe	69.0	218
	Deep	61.0	243
	Hobbs	68.0	239
Cloud Peak	Upper Frozen	5.8[1]	82
	Emerald	55.3	89
	Florence	32.7	85
Fitzpatrick	Ross	61.4	250
Popo Agie	Lower Saddlebag	55.5	220

µeq/l = microequivalents per liter

[1] The background acid-neutralizing capacity is based on only six samples taken between 1997 and 2001

Source: Argonne (2002).

3.4.5.2 Environmental Consequences

Proposed Action

Under the Proposed Action, no significant impacts on lake acidification are expected due to the distances from the Buckskin Mine to sensitive lakes in the region (table 3.4-6). Production would continue at the existing annual rate of 25 million tons. Ongoing sources of impacts on lake acidification would continue as a result of mining the proposed tract. These impacts would not be expected to increase on an annual basis, but would continue for up to two years beyond the current life-of-mine estimate.

Impacts of coal mining on acid deposition are due primarily to NO_x emissions from mining operations, as discussed in section 3.4.3 above. Studies have demonstrated that lake acidification is a regional phenomenon (Dillon et al. 1978). Kiewit has no plans to change its coal production rates or operations, including blasting methods, hauling rates and distances, or other emissions sources. Operations at the Buckskin Mine will continue to employ current control and notification measures for NO_x emissions (outlined in section 3.4.3.3) to minimize the release of emissions into the atmosphere. Modeling for the current Buckskin Mine permit did not forecast any exceedances of the annual particulate or NO_2 NAAQS at the currently permitted production rate of 42 million tons per year that could further contribute to lake acidification; Buckskin's current and anticipated production rates are 25 million tons per year.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected, and no new coal reserves would be mined in the general analysis area. Production would continue at the existing annual rate of 25 million tons. Impacts on lake acidification in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would be associated with activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, no significant impacts on lake acidification are expected due to the distances from the Buckskin Mine to sensitive lakes in the region (table 3.4-6). Production would continue at the existing annual rate of 25 million tons. Ongoing sources of impacts on lake acidification would continue as a result of mining the final tract configuration. These impacts would not be expected to increase on an annual basis, but would continue for up to six years beyond the current life-of-mine estimate.

Kiewit has no plans to change its coal production rates or operations, including blasting methods, hauling rates and distances, or other emissions sources. Operations at the Buckskin Mine will continue to employ current control and notification measures for NO_x emissions (outlined in section 3.4.3.3) to minimize the release of emissions into the atmosphere. Modeling for the current Buckskin Mine permit did not forecast any exceedances of the annual particulate or NO_2 NAAQS at the currently permitted production rate of 42 million tons per year that could further

contribute to lake acidification; Buckskin's current and anticipated production rates are 25 million tons per year.

3.4.6 Regulatory Compliance, Mitigation, and Monitoring

Mitigation and monitoring for coal mine emissions, including the emissions that contribute to the acidification of lakes, are discussed in sections 3.4.2.3, 3.4.2.4, 3.4.3.3, and 3.4.3.4. Other air quality monitoring programs that are in place in the PRB include the Wyoming Air Resources Monitoring System which monitors sulfur and nitrogen concentrations near Buffalo, Sheridan, and Newcastle, and the National Atmospheric Deposition Program, which monitors precipitation chemistry in Newcastle.

3.4.7 Residual Impacts on Air Quality

No residual adverse impacts on air quality would occur following mining and reclamation.

3.5 Water Resources

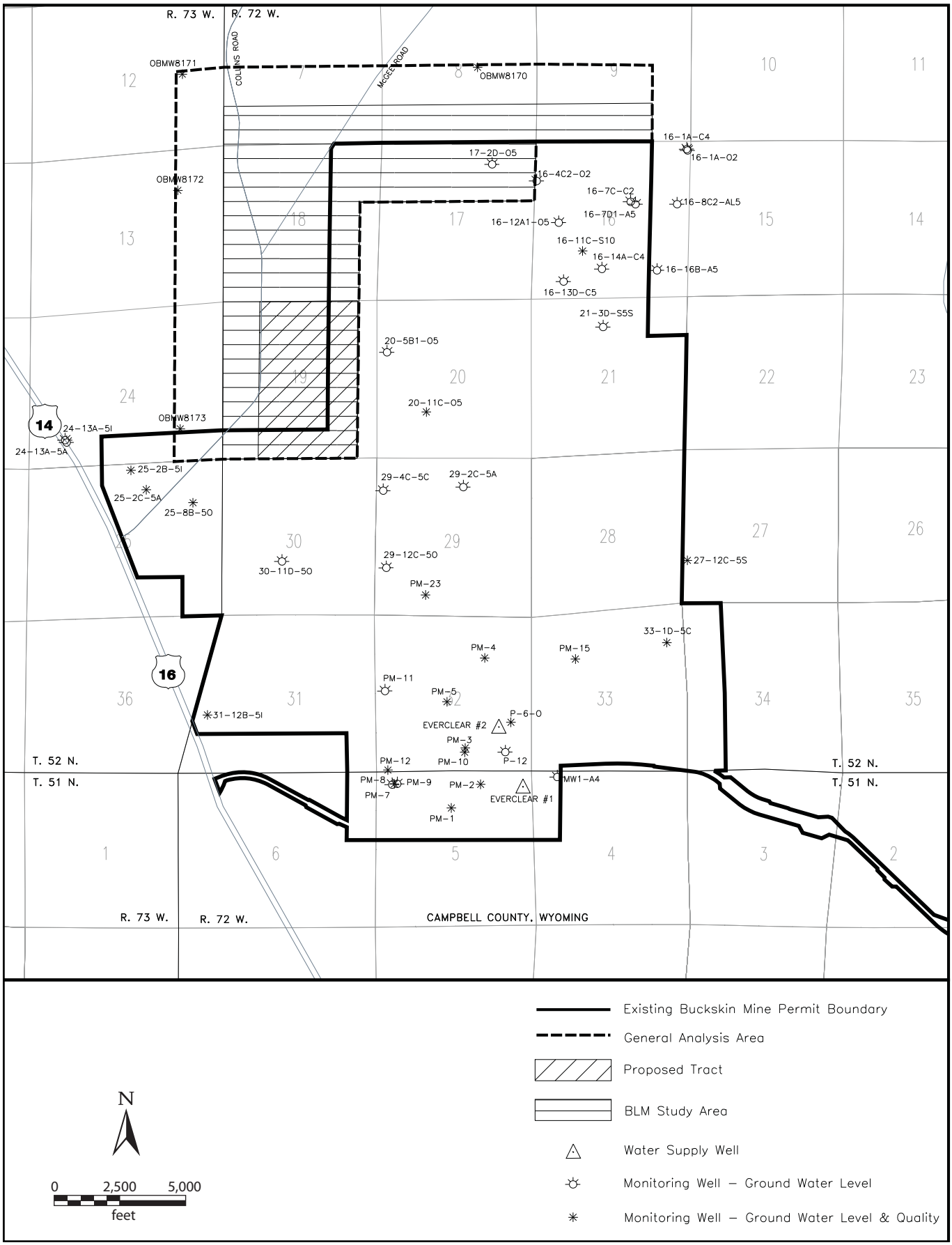
This section describes the affected environment as it relates to water resources in the general analysis area, and identifies potential impacts on water resources that would result from the Proposed Action and alternatives.

3.5.1 Groundwater

3.5.1.1 Affected Environment

Six water-bearing hydrologic units in the general analysis area could be disturbed by mining. In descending order, these units are recent alluvium, the Wasatch Formation, the Anderson coal seam, the Fort Union Formation interburden, and the Canyon coal seam. While the Anderson and Canyon coal seams belong to the Fort Union Formation geologically, they divide the Fort Union Formation into multiple distinct hydrologic sections. The interburden between the Anderson and Canyon coal seams exhibits very low permeabilities and has insufficient yield potential to be considered an aquifer; therefore, it will not be discussed here. The Fort Union Formation that underlies the Canyon coal will not be physically disturbed by mining activities but may be used for water supply.

Aquifer characterization in the general analysis area is based on more than 80 groundwater monitoring wells installed in and adjacent to the WDEQ/LQD permit area between 1980 and 2000 (map 3.5-1). These wells were installed in each of the primary geologic units: alluvium (recent stream-laid and slope-wash deposits), the Wasatch overburden, and the Anderson and Canyon coal seams. These geological units are discussed below.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.5-1

Currently Active Groundwater Monitoring and Water Supply Wells at Buckskin Mine

Recent Alluvium

Groundwater in recent alluvium (sediments deposited by water flow) occurs primarily near and along the valley and draw bottoms associated with Hay Creek. It is directly connected to and recharged by groundwater in adjacent scoria and the Wasatch overburden. Alluvial groundwater flow generally follows topography, flowing out of upland areas into the valley and draw bottoms, then down-valley along the Hay Creek drainage. Hydraulic gradients are similar to the topographic and valley-bottom slopes on which the deposits reside.

Aquifer testing indicates that the hydraulic conductivity, the capacity to transmit water, of stream-laid deposits along the Hay Creek valley bottom range from about 0.40 to 230 feet per day. Deposits in the general analysis area are finer-grained compared to those downstream, and exhibit hydraulic conductivities in the lower range.

Although not alluvium, scoria is considered recent and can be an important groundwater resource. Recent testing and mine dewatering of the scoria near the Hay Creek valley bottom indicates hydraulic conductivities that may exceed 2,000 feet per day. Such high values are common for scoria along the coal outcrops in the PRB.

Groundwater quality in the alluvial deposits is poor, and is generally unsuitable for domestic, agricultural, and livestock uses as defined by the Wyoming groundwater classification suitability criteria (WDEQ/WQD 2005). Total dissolved solids (TDS), the measure of dissolved salts in water and an overall measure of water quality, is relatively high in the Hay Creek alluvium with an average of about 4,500 milligrams per liter. Isolated areas exhibit higher TDS concentrations because of surface water reservoirs that concentrate salts and locally affect alluvial groundwater. Sulfate, which contributes to the overall TDS, is generally high in the alluvium, roughly 10 times the suitability criteria limit.

Wasatch Formation

The principal groundwater occurrence in the Wasatch Formation is in sandstones that can be traced laterally for considerable distances. Aquifer testing of Wasatch sands indicates relatively low hydraulic conductivities that range from less than 1 to about 13 feet per day, with the highest values associated with surface sands that are commonly eolian in origin. These surface sands are the primary contributors of groundwater to the Hay Creek valley alluvium.

Wasatch groundwater generally follows topography, flowing northeast from the upland areas and discharging into the Hay Creek valley and to the scoria deposits in sections 16 and 21. Seeps (groundwater emanating at grade over a broad area) occur in some upland areas where groundwater in the sandstones is near grade, especially in draws.

Groundwater in the Wasatch sandstones is generally better quality when compared to other aquifer units, with an average TDS concentration of about 2,500 milligrams per liter. Overburden groundwater quality meets suitability criteria for livestock, but exceeds TDS and sulfate limits for domestic and irrigation uses.

Anderson and Canyon Coals

The most extensive aquifer units in the general analysis area are the Canyon and Anderson coal seams. The aquifers are defined by the top and bottom of the seam, and are commonly confined by shale, silt, or clay. However, in some areas, groundwater in both seams may also occur in unconfined conditions and may even be unsaturated.

Hydraulic conductivities in the coal seams are generally low and exhibit a range of about 0.0020 to 2.0 feet per day. The variation is due to the degree to which the coal is fractured or its location relative to grade, which controls the degree of weathering.

Measurements taken in the 1980s showed that groundwater flow in the Anderson coal seam was primarily to the east and northeast from upland areas toward discharge zones in the Hay Creek valley. In 2000, some groundwater in the Anderson coal seam was found to flow from east to west. Although some changes in groundwater flow patterns are a result of mine dewatering, changes can also be attributed to CBNG operations west of the general analysis area that began in the mid-1990s.

Based on measurements taken in the 1980s, groundwater flow in the Canyon coal seam was similar to that of the Anderson coal seam (primarily to the northeast). In 2000, flows changed direction from east to west. As with the Anderson coal, in addition to mine dewatering, CBNG activities have contributed to the changes in groundwater flow patterns in the Canyon coal (Hydro-Engineering 2007).

Water quality in the Anderson and Canyon coal seams exhibits considerable variation depending on the concentrations of major dissolved constituents, and is dominated by calcium, magnesium, and sulfate. Groundwater in the overburden affects water quality in the coals. CBNG drawdown may further affect water quality by creating induced hydraulic gradients in the coals. Coal groundwater, where present and still unaffected by mining or CBNG, is suitable for livestock use in some areas. In other areas, it is unsuitable for livestock or irrigation use because of elevated dissolved constituents or sodium adsorption ratio, a measure of the effect of sodium on soils. Elevated ammonia is consistent in both coal seams where bicarbonate dominates the anionic species, a phenomenon typical for coal groundwater in general.

Subcoal Fort Union Formation

The target coal seams in the general analysis area occur within the uppermost portion of the Tongue River member of the Fort Union Formation. The underlying Lebo and Tullock members consist of lithologies similar to that of the Tongue River, with sandstone predominating the Tullock and shale predominating the Lebo. The Lebo is commonly a confining unit between the Tongue River and Tullock members.

The Tullock aquifer commonly exhibits transmissivity, the rate at which water is transmitted through an aquifer, that is higher than that of the Tongue River aquifer. This makes it a common water supply. The average transmissivity for this member as reported by the OSM (1984) is 290 square feet per day (2,200 gallons per day per foot).

Buckskin Mine uses two water supply wells completed in the Tullock aquifer south of the general analysis area (map 3.5-1). These wells supply water for both mining operations and on-site domestic use.

3.5.1.2 Environmental Consequences

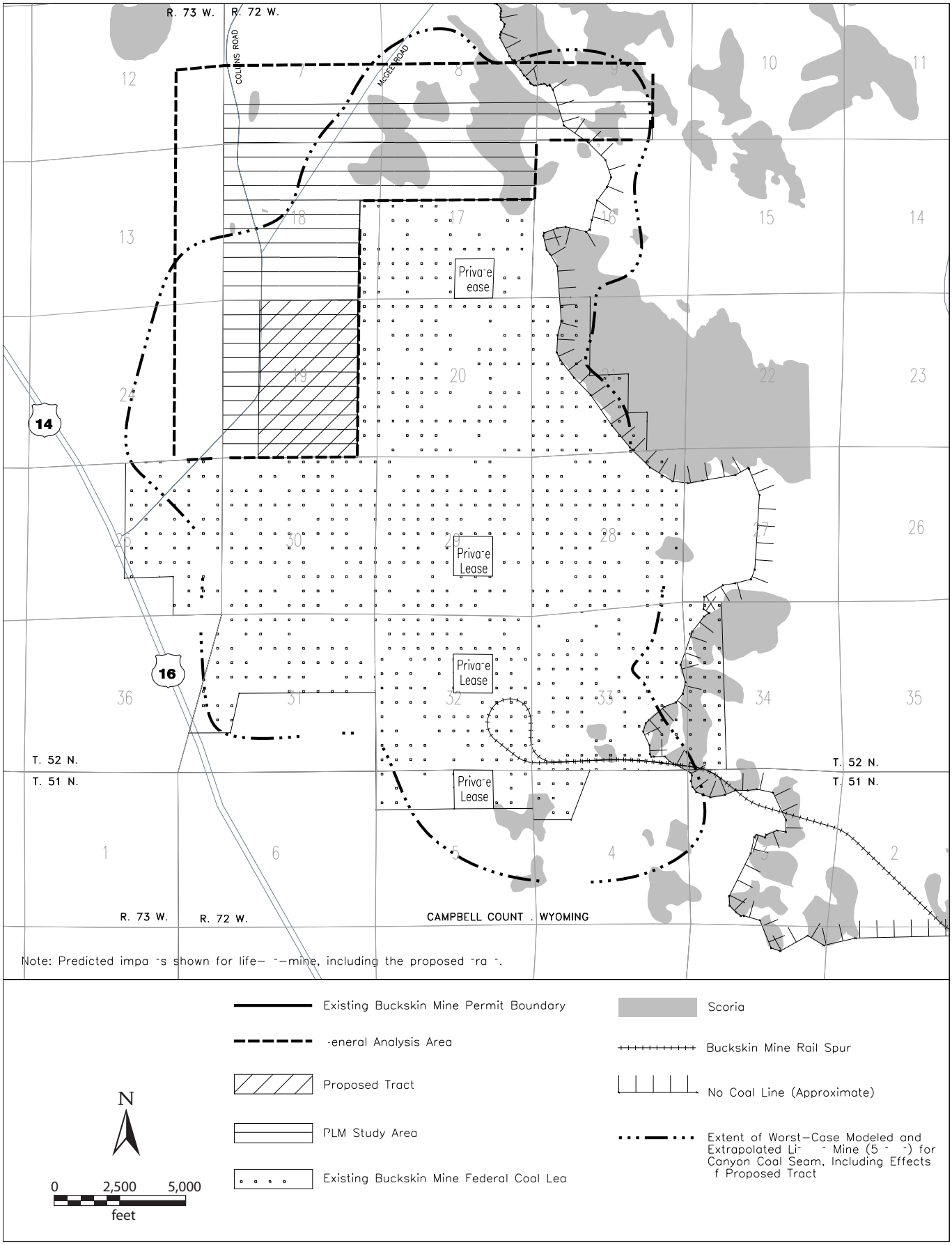
Proposed Action

Under the Proposed Action, surface coal mining would permanently remove aquifers in the proposed tract (419 acres). Additionally, the Proposed Action would cause a long-term reduction in groundwater in aquifers beyond the proposed tract as a result of seepage into and dewatering from mine excavations. This reduction in groundwater is referred to as drawdown. The extent of drawdown would depend on how long the mine excavations are open, the distance of the aquifers from the proposed tract, and the extent of dewatering. Map 3.5-2 illustrates the extent of drawdown under the Proposed Action, taking into account mining of existing leases. The extent of dewatering depends on aquifer transmissivity, storage capacity, and heterogeneity, as well as the period over which dewatering occurs. Drawdown would extend farther in clean Wasatch sands that exhibit a relatively high transmissivity than in less permeable materials. Dewatering through drawdown would also be most prevalent where these sands are laterally continuous. Drawdown patterns are more variable in aquifers that have more heterogeous sands, such as the Wasatch and Fort Union sands.

Aquifer drawdown extends farther and occurs in a more consistent manner in the Anderson and Canyon coal seams than in the overburden because the aquifers have more homogeneous characteristics. However, drawdown can be substantially affected by variations in hydrogeologic characteristics such as fracture density, proximity to crop lines, recharge potential from overlying units, and lateral continuity. Such variations have been observed at the Buckskin Mine and would be likely in the proposed tract. Therefore, drawdown in the coals away from the mine is expected to behave in a similar manner to that observed to date.

CBNG development, where present, would continue to have substantial effects on drawdown, especially in the coal seams. In the absence of CBNG development, drawdown typically is greatest near the mine, and decreases substantially away from the mine. Therefore, the Proposed Action would have greater impacts on near-mine groundwater resources than on those farther from the mine.

Two water supply wells from the underburden aquifer are currently used by the Buckskin Mine. Although the evaluation of adequate water supply is ongoing as mining progresses, the mine may not require additional underburden water supply wells to mine the proposed tract. If that is the case, the existing wells would continue to be used under the Proposed Action and presumably through the life of the mine. Due to its proximity to the existing Buckskin Mine, groundwater quality in the backfill aquifer on the proposed tract is expected to be similar to that measured in existing wells completed in the backfill at the mine. Variations in water quality may occur because of differences in the proportions of materials (i.e., sands, silts, and clays) used to reclaim the aquifer. Groundwater is expected to rise to similar levels as observed prior to mining, but varied groundwater levels, vertical hydraulic gradients, and perched aquifer zones would not occur to the same degree because of the more homogeneous nature of the backfill.



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Map 3.5-2

Extent of Drawdown under Proposed Action

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on groundwater resources in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of dewatering and withdrawals resulting from coal recovery in contiguous leases within the existing Buckskin Mine permit area. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining would permanently remove aquifers in up to 1,833 acres. Long-term groundwater reduction in near-mine aquifers west of the final tract configuration would extend farther than under the Proposed Action, and would continue for up to six years beyond the current life-of-mine estimate.

CBNG development, where present, would continue to have substantial effects on drawdown, especially in the coal seams. Based on monitoring results to date, the two water supply wells currently in use could remain viable through the life of the mine. Groundwater quality in the backfill aquifer in the general analysis area is expected to be similar to that measured in existing wells completed in the backfill at the mine.

3.5.1.3 Regulatory Compliance, Mitigation, and Monitoring

If one of the action alternatives is implemented, Kiewit will complete baseline studies regarding regional and site-specific hydrogeologic characteristics to account for additional permitted area. As part of the baseline hydrogeologic studies for the existing permit area, Kiewit has installed monitoring wells in the alluvium, overburden, interburden, coals, and underburden to evaluate impacts on groundwater from mining activities. Also installed as part of the mining permit reclamation plan are backfill monitoring wells to evaluate groundwater of mine spoils as they resaturate. If one of the action alternatives is implemented, Kiewit will expand these monitoring programs to address additional lease area as well as reclaimed areas on existing leases and will document groundwater monitoring in the mining permit amendment as well as in annual reports submitted to the WDEQ/LQD.

3.5.2 Surface Water

3.5.2.1 Affected Environment

Surface Water Characteristics

The most prominent surface water feature in the general analysis area is Hay Creek (map 3.5-3). Hay Creek topographically originates northwest of the general analysis area, in the NW4 of section 7, and then flows into the area and through section 18. The creek is mined out in the central and southern portions of section 17, and is diverted to rejoin the undisturbed creek in the

W2 of section 16. Hay Creek is considered a minor stream in the regional drainage network of the Little Powder River. According to WDEQ/WQD Rules and Regulations (Chapter 1 Section 4), Hay Creek, although unclassified, would be characterized as a class 4 stream having intermittent or ephemeral flow that is protected for agricultural uses and wildlife watering.

The creek is ephemeral in nature (i.e., responds only to rainfall or snow-melt events) as it enters the general analysis area in the SW4 of section 7. Down-valley of this location the valley bottom flattens, and Hay Creek is a poorly defined, ephemeral channel. Downstream of its undisturbed location in section 16, the creek varies between intermittent (i.e., flows for less than half of the year) and ephemeral as it courses eastward along a well-defined channel.

At its confluence with the Little Powder River, about 2 miles east of the general analysis area, Hay Creek drains 15 square miles. The channel elevation drops about 34 feet over a channel length of 8,100 feet across the area, equating to an average channel slope of 0.0042.

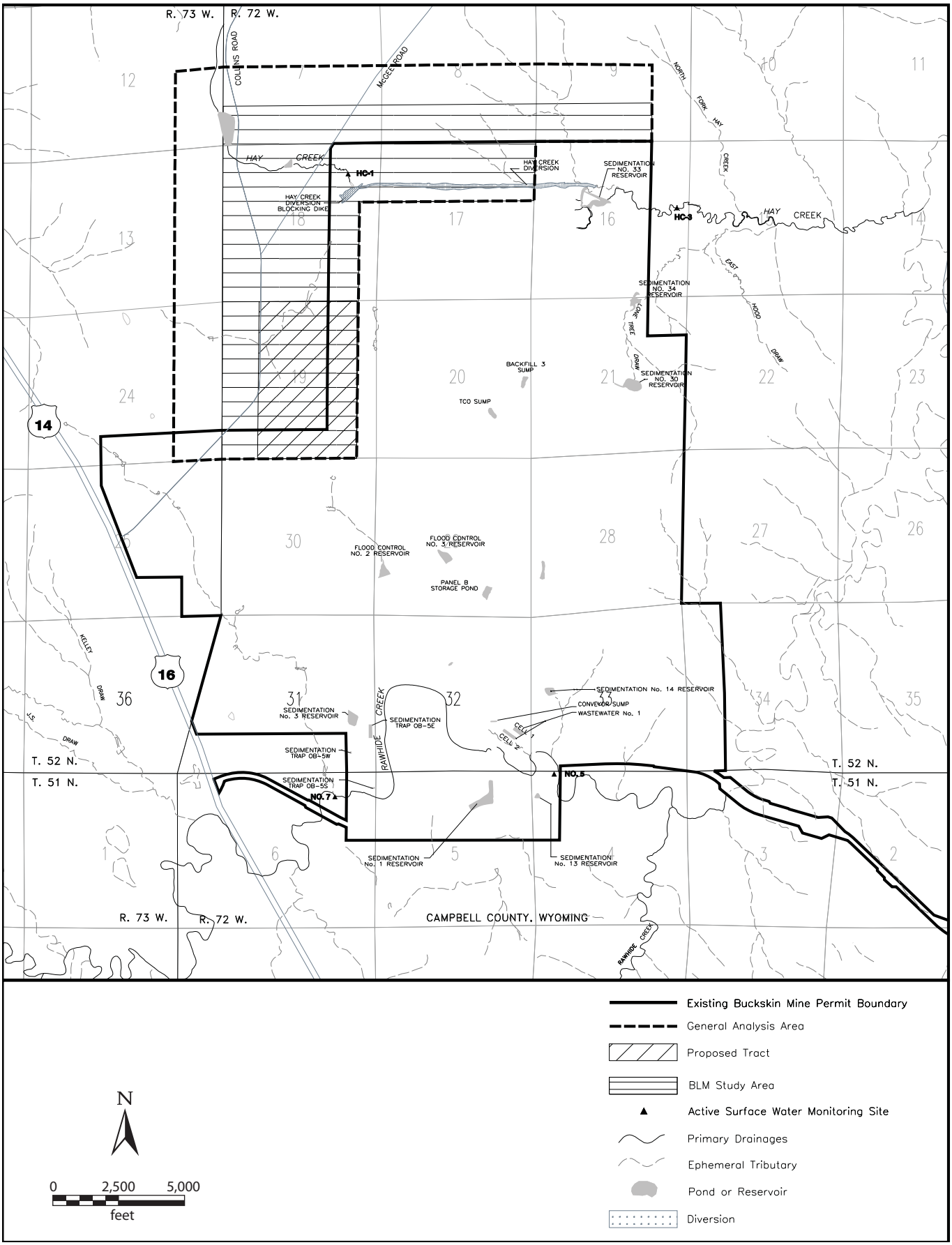
Hay Creek monitoring has been conducted since 1999 in the general analysis area in the NE4NE4 of section 18, and east of the area in the SE4NE4 of section 16. Monitoring has included both continuous flow measurements and periodic water quality sampling.

Monitoring at both stations indicates that Hay Creek varies from dry to average base flows (flows that occur from normal contributions of groundwater) on the order of less than 1 cubic foot per second (cfs). Response to intense rainfall events may elevate the flow for short periods. CBNG well discharges have also affected stream flow in Hay Creek, resulting in fairly consistent but unnatural flows.

Estimated runoff in the general analysis area, based on quantitative modeling, is 2.7 cfs for a 10-year, 6-hour storm and 17 cfs for a 2-year, 24-hour storm. These estimates ignore the retarding effects of watershed impoundments on flow rates, so they represent maximum estimated runoff values. The runoff from the 10-year event is agriculturally significant because such a storm has an equal chance of occurring in any given year, and thus can be important for natural flood irrigation. The estimated runoff for the 2-year storm in the Hay Creek valley bottom is not considered agriculturally significant.

Several impoundments are located in the general analysis area, in sections 17, 18, and 19. Named reservoirs with state engineer's office (SEO) appropriations in the general analysis area include Franklin #1 stock reservoir in the N2 of section 18 and Hay Creek blocking dike reservoir in the NW4NW4 of section 17. While these reservoirs provide a beneficial use for their appropriation, they affect groundwater and surface water hydrology. By temporarily storing water from both base flow and ephemeral events, these reservoirs generally decrease downstream flow by allowing localized evaporation and infiltration to groundwater.

Impoundments in the general analysis area have storage capacities ranging from about 0.90 to 12 acre-feet, with a combined storage capacity of about 26 acre-feet. Estimated annual runoff volumes from contributing watersheds generally exceed the storage volumes of these impoundments. Reservoirs south of the general analysis area in the central and southern portions of section 17 have been mined out.



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Map 3.5-3

Surface Water Features in the General Analysis Area

Several ephemeral channels in the general analysis area contribute drainage area to the Hay Creek valley. Three prominent, southeast-trending draws are located in sections 8 and 9, and two other prominent draws are located in sections 18 and 19.

Surface Water Quality

Monitoring at various locations along Hay Creek in the general analysis area indicates that water quality is poor. Water quality varies along the creek and is affected by in-channel impoundments that extend the amount time that the water is exposed to alluvial materials and concentrations of dissolved minerals through evaporation. Surface water quality has also been affected by CBNG discharges that contribute to apparent elevated sodium bicarbonate levels that are more characteristic of coal groundwater and not surface water in Hay Creek.

Water quality is generally acceptable for livestock most of the time. Elevated TDS, sodium adsorption ratio, manganese, and sulfate may exceed WDEQ suitability criteria for irrigation. Prior to mining in the northern portion of section 17, TDS downstream of McGee Reservoir was roughly double that at upstream locations primarily as a result of elevated calcium and magnesium sulfate.

3.5.2.2 Environmental Consequences

Proposed Action

Under the Proposed Action, coal mining would have significant temporary effects on surface water runoff characteristics in the proposed tract. Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal. Water flow and direction in that area would be altered by the removal and reconstruction of drainage channels prior to mining and from redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. No connected water bodies cross the proposed tract, so no additional channel diversions are anticipated under the Proposed Action. Regardless of planned mining and reclamation activities, large storms that exceed capacity designs for sediment-control structures (typically a storm that would exceed the 10-year, 24-hour rainfall) could produce sediments that have impacts on areas downstream of mining operations.

Upon completion of reclamation, when soil structure and vegetation have been reestablished, surface water flow, quality, and sediment discharge would approximate premining conditions. Soil structure would gradually develop with time, and vegetation would mature and increasingly provide erosion protection. Hay Creek and surrounding drainages would be reclaimed to exhibit premining channel characteristics, and would be replaced in approximately the same locations. The basic hydrologic functions of the valley bottom would be restored to approximate premining characteristics.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on surface water in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area

boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. Water flow and direction in that area would be further altered by the removal and reconstruction of any drainage channels prior to mining, and redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, impacts on surface water would be the same as those described for the Proposed Action but would extend to an area of up to 1,883 acres. Erosion and sediment discharge would likely increase in disturbed areas because of vegetation removal. Water flow and direction would be altered by the removal and reconstruction of drainage channels prior to mining and from redirected flow through the use of erosion- and sediment-control structures to manage surface water runoff from disturbed areas. Additionally, Hay Creek's main channel, extending from the NW corner of section 18 to the point where it enters the existing mine permit along the eastern section line of section 18, could be removed. Channels draining into the Hay Creek valley bottom could also be removed to recover coal in the western half of section 18 and section 19. As described in chapter 2, Kiewit does not anticipate relocating any county roads or causing new disturbance in the operationally limited lands between the two roads. Consequently, Kiewit does not anticipate the construction of any further diversions on Hay Creek west of the current permit boundary.

3.5.2.3 Regulatory Compliance, Mitigation, and Monitoring

If one of the action alternatives is implemented, Hay Creek and major channels will be restored after completion of mining operations, in accordance with SMCRA and Article 4 of the Wyoming Environmental Quality Act.

According to WDEQ/LQD Rules and Regulations (Chapter 4 Section 2(e)), other permit requirements include constructing sediment-control structures to manage and treat surface water discharges from disturbed areas and restoring reservoirs and playas disturbed during mining. Reservoirs in sections 17, 18, and 19 would be reconstructed and replaced in the approximate premining locations. Surface water quantity and quality in the restored Hay Creek channel would be monitored periodically per WDEQ/LQD requirements.

3.5.3 Water Rights

3.5.3.1 Affected Environment

The State Engineer's Office administers water rights in Wyoming, which are granted for both groundwater and surface water. Their records indicate that, as of May 2008, 2,380 permits for groundwater rights are within 3 miles of the general analysis area, 1,166 of which are for

non-coal applicants. Groundwater rights for non-coal applicants are listed in appendix G. The breakdown of groundwater rights is as follows:

- 324 stock, CBNG
- 152 CBNG
- 156 miscellaneous
- 101 monitoring
- 96 stock, miscellaneous, CBNG
- 71 miscellaneous, stock
- 73 stock
- 64 temporary filings
- 60 domestic, stock
- 38 domestic
- 19 CBNG, reservoir supply, miscellaneous
- 8 stock, miscellaneous
- 2 industrial
- 1 domestic, miscellaneous
- 1 irrigation

State Engineer's Office records indicate that, as of May 2008, 368 permits for surface water rights are within 3 miles of the general analysis area, 308 of which are for non-coal applicants. Surface water rights for non-coal applicants are listed in appendix G. The breakdown of surface water rights is as follows:

Adjudicated (129 total):

- 71 irrigation
- 26 miscellaneous
- 20 stock
- 9 irrigation, domestic
- 3 irrigation, reservoir supply

Un-adjudicated (179 total):

- 106 stock
- 32 irrigation
- 15 irrigation, reservoir supply

- 13 oil refining/production, temporary use, industrial, drilling
- 6 irrigation, domestic
- 5 industrial
- 2 stock, domestic

3.5.3.2 Environmental Consequences

Proposed Action

Under the Proposed Action, groundwater rights associated with existing water supply wells would experience moderate, long-term adverse impacts from the removal of aquifers in the proposed tract as a result of mining. Additionally, mine dewatering would affect existing wells near the proposed tract in the Wasatch or Fort Union formations above the Canyon coal seam; wells below the Canyon coal seam would not be affected.

Additional impacts on groundwater rights from CBNG development would continue. Impacts on water supply wells completed in the same coals where CBNG development is occurring may be affected as well as other wells that have hydraulic connections to these coals. The extent of impacts on these wells by CBNG development depends on how close they are to the CBNG extraction wells, the length of time groundwater withdrawals occur, and the hydraulic connection to aquifers from which CBNG groundwater withdrawals are occurring.

Under the Proposed Action, one surface water right, associated with the small tributary to Hay Creek that would be removed during mining, would be affected. Mining activities would affect surface water rights down-slope of the general analysis area as a result of significantly alterred hydraulic characteristics of Hay Creek valley and its associated draws. Potential impacts include a reduction of surface water flow and a change in surface water quality from mining-related sediment discharges. Surface water rights up-slope of the general analysis area would not be affected.

Alternative 1 (No Action)

Under No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on water rights in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of impacts on downstream surface water rights resulting from the removal of Hay Creek from the N2 of section 17, as well as surrounding ephemeral draws, and impacts related to CBNG development from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, impacts would be the same as those described for the Proposed Action, but could occur over a larger area. Additional groundwater rights could be removed, and dewatering impacts on groundwater rights could extend farther to the west. One additional surface water right in the western half of section 18 could be removed; an additional reach of Hay Creek in the northwestern corner of section 18 could be removed; and channels that lead to the Hay Creek valley bottom could be removed to recover coal in the western half of sections 18 and 19. The latter two impacts are not expected because Kiewit does not anticipate relocating any county roads or causing any new disturbance on the operationally limited lands between the roads.

3.5.3.3 Regulatory Compliance, Mitigation, and Monitoring

SMCRA and Wyoming state statutes (Title 41—Water) govern the protection of groundwater and surface water rights. Mine operators are required to provide the owner of a water right whose water source is interrupted, discontinued, or diminished by mining with water of equivalent quantity and quality.

If one of the action alternatives is implemented, Kiewit will update the list of private water supply wells that could be affected by mining and predict impacts on those wells as part of the WDEQ/LQD permitting process. Kiewit will commit to replacing those water supplies affected by mining with water of equivalent quality and quantity. Kiewit will reconstruct Hay Creek, surrounding channels, and reservoirs to restore surface water rights affected by mining. The permit reclamation plan must specify reconstruction methods to restore surface water features similar to those characterized prior to mining. Periodic monitoring of surface water flows and quality will be required ensure that flows and water quality are similar to premining conditions.

3.5.4 Residual Impacts

The action alternatives would have significant impacts on groundwater quantity as a result of removing aquifers and extracting groundwater. Although groundwater quantity would begin to recover once the backfill is replaced and the aquifer recharge begins, full recovery of groundwater levels in and adjacent to the general analysis area could extend well beyond the life of mine. The action alternatives would have permanent impacts on groundwater elevations (i.e., water table depths) related to perching (underground benches that can trap water), geologic layering (affecting underground water flow), or heterogeneity (affecting permeability).

Groundwater quality is expected to return to premining conditions—adequate for livestock use—though it may exhibit slight but permanent variations related to the nature of the backfill.

Because of the ephemeral nature of Hay Creek in the general analysis area, the action alternatives would have no residual impacts on surface water. Successful reclamation would ensure that rainfall would be adequately conveyed through reclaimed channels and stored in reclaimed reservoirs.

3.6 Alluvial Valley Floors

This section discusses the affected environment as it relates to alluvial valley floors (AVFs) in the general analysis area and the adjacent Buckskin Mine permit area and identifies any impacts on AVFs that would result from the Proposed Action and alternatives.

Prior to leasing and mining, AVFs must be identified because, under the SMCRA, mining on AVFs is prohibited unless the affected AVF is undeveloped rangeland that is insignificant to farming or is of such small acreage that it would have a negligible impact on a farm's agricultural production. These restrictions also apply to AVFs that are downstream of mining but might be affected by streamflow or groundwater impacts. AVFs not significant to agriculture can be disturbed during mining but must be restored as part of the reclamation process.

3.6.1 Affected Environment

Hay Creek is ephemeral in nature (i.e., it responds only to rainfall or snowmelt events) as it enters the general analysis area in the SW4SW4 of section 7 and flows to the east. Down-valley of this location the creek bottom flattens a poorly defined channel throughout the remainder of the general analysis area. Section 3.5 describes various aspects of the Hay Creek drainage, including its physical characteristics, potential for flood irrigation, and apparent subirrigated areas, among other features. In alluvial valley floors, subirrigation refers to the supplying of water to plants from underneath, or from a semi-saturated or saturated subsurface zone where water is available for use by vegetation (30 CFR 701.5).

WDEQ/LQD Rules and Regulations define AVFs as unconsolidated stream-laid deposits where water is available in sufficient quantities for agricultural activities (30 CFR 701.5). OSM and WDEQ/LQD have established guidelines to identify AVFs. These guidelines require detailed studies of geomorphology, soils, hydrology, vegetation, and land use, and are used to identify the following elements:

- presence of unconsolidated stream-laid deposits,
- potential for flood irrigation practices,
- evidence of past or present flood irrigation, and
- apparent subirrigated areas and the potential for natural flood irrigation.

Areas identified as AVFs following these studies are evaluated for their significance to farming by the WDEQ/LQD.

The WDEQ has not identified the agricultural productivity of the Hay Creek valley floor as significant to farming. Moreover, interviews with landowners and lessees who have agricultural operations in the Hay Creek valley floor consistently described failed or no attempts to develop artificial flood irrigation along Hay Creek (Buckskin Mining Company 2000).

3.6.1.1 Studies Conducted to Determine Presence of Alluvial Valley Floors

The primary AVF investigation in the general analysis area was completed in 2000. Investigations specific to section 16, east of that area, were completed by Triton Coal Company between 1980 and 1982, and the results from these investigations were incorporated into the 2000 investigation. These AVF studies were conducted as part of the WDEQ/LQD mine permitting process to recover coal under Buckskin Mine's existing leases.

These investigations initially concluded that the Hay Creek valley bottom (including the portion that passes through the general analysis area) is not an AVF, as defined by WDEQ/LQD. That agency challenged this conclusion and determined that a portion of the Hay Creek valley floor is an AVF. The Wyoming Environmental Quality Council overturned this determination and upheld the original conclusion that the valley floor is not an AVF. A copy of the Environmental Quality Council order is included in appendix H.

The findings of the investigations are described below.

Presence of Unconsolidated Stream-Laid Deposits

No stream-laid deposits are present in the general analysis area. Stream-laid deposits do occur in portions of the Hay Creek valley bottom and some associated upland draws beyond the general analysis area. Those areas consist of sand, gravel, and silt deposited by streamflow within Hay Creek and its tributaries. Prior to mining through the creek channel in the northern portion of section 17, mapped stream-laid deposits down-valley of the general analysis area occupied about 57 acres on the creek bed. These deposits typically varied from about 80 to 500 feet wide, and were about 20 feet thick. Stream-laid deposits terminate before entering the reservoir in the general analysis area in the SW4NW4 of section 17. Upstream of that reservoir in the general analysis area, the valley-bottom deposits consist of slope wash overlying bedrock. Slope wash occurs along the bottom slopes of hills and in channel bottoms, including the Hay Creek valley bottom in section 18, and consists of reworked sediment deposited by overland flow. These are not fluvial (stream-laid) deposits associated with Hay Creek.

Potential for Flood Irrigation

Runoff from the two-year, 24-hour storm event, generally considered agriculturally useful, yields about 11 acre-feet of water in the vicinity of the Buckskin Mine. This runoff volume is small relative to the cumulative storage capacity of reservoirs in the valley bottom and would not be sufficient to support any reliable flood irrigation practices.

Poor surface water and groundwater quality in Hay Creek and its alluvium, respectively, would make it generally unsuitable for domestic, agricultural, and livestock uses. The poor groundwater quality is attributed to the effect of reservoirs that locally concentrate salts and to natural groundwater quality characteristics of adjacent deposits that recharge the alluvium. Water quality is discussed in detail in section 3.5.

Groundwater quality in the Hay Creek alluvium is poor, and is generally unsuitable for domestic, agricultural, and livestock uses. Sulfate, which contributes to the overall TDS, is generally high

in the alluvium, roughly ten times the suitability criteria limits. The poor groundwater quality is attributed to the effect of reservoirs that locally concentrate salts and to natural groundwater quality characteristics of adjacent deposits that recharge the alluvium.

The agriculturally useful flood is of insufficient volume to support any reliable flood irrigation practices. Runoff from the 2-year, 24-hour storm event, which is generally considered to be of agricultural use, yields about 11 acre-feet of water. This runoff volume is small relative to the cumulative storage capacity of reservoirs in the valley bottom and will not produce a flood that is useful for irrigation.

Soils in the valley bottom also are of poor quality and are not suitable for irrigation purposes. Elevated electrical conductivity, boron, and selenium make the soils along Hay Creek unsuitable for irrigated row crops or improved pasture. The elevated electrical conductivity results in less water being available to plants because of osmotic potentials that exceed the capability of the plant to extract water from the soil. Boron toxicity may result in slowed growth and reduced production. Toxic concentrations of selenium may result in selenosis in livestock.

Evidence of Flood Irrigation and Subirrigated Areas

Plant species of agricultural interest have developed voluntarily in the native rangelands of the Hay Creek valley floor without any evidence that they were intentionally introduced for range improvement practices. Plant communities in the general analysis area that require flood irrigation are limited to the channel bottom along Hay Creek. Subirrigated vegetation occurs along and in the Hay Creek channel, adjacent to the channel in specific areas, and in isolated locations in upland areas. No evidence exists to indicate that these subirrigated plant species were specifically developed to exploit natural subirrigation.

3.6.2 Environmental Consequences

3.6.2.1 Proposed Action

Under the Proposed Action, no AVFs would be affected because none are present in the proposed tract. No primary drainages occur in the proposed tract. One isolated, ephemeral draw crosses the northwestern corner of the area, but it does not connect with Hay Creek or any other drainage, and, therefore, does not include AVFs.

As described in section 3.5, groundwater intercepted by dewatering activities would be routed through settling ponds to meet state and federal water quality criteria. Dewatering the alluvium in the proposed tract would not affect off-site alluvial groundwater downstream of the tract because no alluvium is present there and because the closed drainage in the area cannot contribute flow or alluvium to other systems. Dewatering could indirectly affect off-site alluvial groundwater up-valley of the proposed tract by creating a zone of influence (drainage area) that could extend beyond the tract boundary.

3.6.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. No AVFs have been identified within the portion of Hay Creek that overlaps the general analysis area and the existing Buckskin Mine permit area (i.e., the area already subject to disturbance). The majority of that segment of the creek channel has already been diverted as part of previously permitted mining activities, and Kiewit does not anticipate diverting any additional sections of that creek. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area the future.

3.6.2.3 Alternative 2

Under Alternative 2, no AVFs would be affected because none are present in the general analysis area, including the Hay Creek channel and floodplain.

Mining could remove additional portions of the Hay Creek valley floor and associated features in the northern half of section 18 and the southwestern corner of the northwestern quarter of section 17. Kiewit does not anticipate any further diversions on Hay Creek, and has constructed a blocking dike at the western end of the current diversion to channel streamflow from the natural drainage into the existing structure. Indirect impacts (potential dewatering of alluvium) upstream of mine operations would be the same as those described for the Proposed Action, but could extend over a larger area.

The Buckskin Mine has constructed a diversion for the valley floor that has been mined out in section 17. As mining approaches the valley floor in section 18, dewatering activities would deplete alluvial groundwater in the valley. Mining would subsequently progress across the valley floor and remove the alluvium. Stream diversions could be constructed to ensure that instream flows are preserved while mining progresses across the valley floor, though no additional diversions are expected to be constructed at this time.

Groundwater intercepted by dewatering activities would be routed through settling ponds to meet state and federal water quality criteria. If additional diversions are constructed, discharges from these ponds would potentially increase the frequency and amount of flow in Hay Creek downstream of mining activities, thereby increasing surface water supplies outside the general analysis area to the east. Dewatering the alluvium in the final tract configuration would not affect off-site alluvial groundwater downstream of the tract because the alluvium in section 17 has already been removed. Dewatering could indirectly affect off-site alluvial groundwater up-valley of the tract by creating a zone of influence (drainage area) that could extend up-valley and northwest of the tract.

3.6.3 Regulatory Compliance, Mitigation, and Monitoring

WDEQ/LQD Rules and Regulations (Chapter 5) and SMCRA both relate to AVFs. If either of the action alternatives is implemented, the following mitigation and monitoring will be required.

Basic surface water functions in Hay Creek will be restored during reclamation to ensure that water can be conveyed from the upstream, undisturbed point on the creek channel to the downstream tie-in point east of the general analysis area. The portion of the channel that will pass through the reclaimed mine spoils will be constructed to simulate the characteristics of the premining native channel. Consideration will be given to erosional stability and to the reconstruction of ephemeral channels that would lead into the reclaimed valley floor. Surface water will be monitored to evaluate water quantity and quality through the reclaimed areas. Monitoring sites and frequency will be determined by WDEQ/LQD guidelines.

3.6.4 Residual Impacts

No AVFs have been identified in the general analysis area, and the majority of Hay Creek has already been diverted according to appropriate regulations to accommodate existing mining operations. Groundwater is expected to recharge and be reestablished in a similar manner to premining conditions, but may not exhibit the same hydrologic or chemical characteristics. The stream channel and the reclaimed valley floor would be reconstructed to mimic premining characteristics, but reconstruction would be an approximation. These impacts would be permanent but insignificant due to the absence of AVFs in the general analysis area.

3.7 Wetlands

This section discusses the affected environment as it relates to wetlands identified in the general analysis area through the National Wetland Inventory (NWI) mapping system (USFWS 2007) and identifies impacts on those wetlands that would result from the Proposed Action and alternatives. For the purposes of this analysis, wetland determinations in the general analysis area were based on the NWI maps and a 2007 reconnaissance-level field visit by trained ICF Jones & Stokes wetland biologists. The field visit was conducted to ground-truth the current status of previously mapped NWI wetlands, in keeping with current BLM Data Adequacy Standards (1987) for EIS analyses of wetlands.

3.7.1 Affected Environment

“Waters of the U.S.” is a collective term for all areas subject to regulation by the U.S. Army Corps of Engineers (Corps) under Section 404 of the Clean Water Act. Waters of the U.S. include special aquatic sites, large or small geographic areas that possess special ecological characteristics of productivity, habitat, wildlife protection, or other important and easily disrupted ecological values (40 CFR 230.3). Wetlands are a type of special aquatic site defined as “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” (33 CFR 328.3(a)(7)(b)).

Jurisdictional wetlands are defined as those wetlands that are within the extent of the Corps’ regulatory review. These wetlands must contain three components: hydric soil, a dominance of

hydrophytic vegetation, and wetland hydrology.[2] The Corps, in conjunction with the EPA, has the authorization to determine whether a delinated wetland is jurisdictional or nonjurisdictional, as discussed in detail under section 3.7.3. Nonjurisdictional wetlands are generally associated with internally drained depressions/playas that are isolated; nonjurisdictional other waters of the U.S. generally occur where areas of open water are ponded in a depression/playa area. Functional wetlands are areas that may contain only one or two of the three wetland criteria. The USFWS uses this third categorization in producing the NWI maps, which are based on aerial photo interpretation with limited or no field verification.

The NWI maps show several wetlands occurring in the general analysis area (USFWS 2007). Many of these areas correspond with wetlands and other waters of the U.S. that were identified during previous wetland delineations of the Buckskin Mine; however, some of the information shown on these maps is relatively old and does not reflect current conditions. Based on the NWI maps, approximately 64.44 acres of wetlands have been identified (map 3.7-1) in the general analysis area. Of these, 30.7 acres were determined to be potentially jurisdictional wetlands based on field observations (table 3.7-1); the remaining 33.74 acres were initially determined to be nonjurisdictional non-wetlands (e.g., borrow pits, old impoundments) or no longer present (table 3.7-2). The majority of the potential jurisdictional wetlands were associated with Hay Creek and other ephemeral tributaries in the general analysis area. Some wetlands previously mapped on the NWI may have been altered due to agricultural uses and permitted mine disturbance or CBNG-related water production in the general analysis area.

Table 3.7-1. NWI Wetlands in the General Analysis Area

Wetland Name	NWI Wetland Classifications[1]	Wetland Type	Field Determination[2]	Acres
NWI 1	PABFh	Freshwater pond	Wetland (impounded)	0.24
NWI 2	PEMAh	Freshwater emergent wetland	Wetland (CBNG pond)	0.26
NWI 5	PEMCh	Freshwater emergent wetland	Wetland (impounded)	0.10
NWI 6	PEMAh	Freshwater emergent wetland	Wetland (CBNG pond)	0.29
NWI 7	PEMA PEMC	Freshwater emergent wetland	Wetland (temporary ponding)	3.0
NWI 8	PUBFx PEMA PEMC	Freshwater emergent wetland and freshwater pond	Wetland (dry playa)	22.82
NWI 9	PUSAx	Other	Wetland (surface ponding)	0.10

[2] As a result of recent Supreme Court rulings (Solid Waste Agency of Northern Cook County vs. United States Army Corps of Engineers, January 9, 2001; and consolidated cases Rapanos vs. United States and Carabell vs. United States, known as the "Rapanos" decision, June 19, 2006) non-navigable, isolated intrastate wetlands (e.g., playas) and other waters of the U.S. are not considered jurisdictional.

Wetland Name	NWI Wetland Classifications[1]	Wetland Type	Field Determination[2]	Acres
NWI 11	PEMA	Freshwater emergent wetland	Wetland (farmed wetland)	2.24
NWI 12	PEMCh PABFh)	Freshwater emergent wetland and freshwater pond	Wetland (impounded)	0.58
NWI 14	PEMCh	Freshwater emergent wetland	Wetland (CBNG pond)	0.24
NWI 15	PEMAh	Freshwater emergent wetland	Wetland (impoundment)	0.15
NWI 17	PABFh	Freshwater pond	Wetland (dry impoundment)	0.68
Total Acres				30.7

NWI = National Wetland Inventory; P = palustrine; EM = emergent; AB = aquatic bed; US = unconsolidated shore; A = temporarily flooded; F = semi-permanently flooded; C = seasonally flooded; x = excavated; h = diked/impounded; CBNG = coal bed natural gas

[1] Some of the wetlands studied had multiple wetland classifications associated with the wetland.

[2] Based on 2007 reconnaissance-level field visit.Source: USFWS 2007; Cowardin 1979.

Table 3.7-2. NWI Wetlands Determined to Be Non-Wetlands in the General Analysis Area

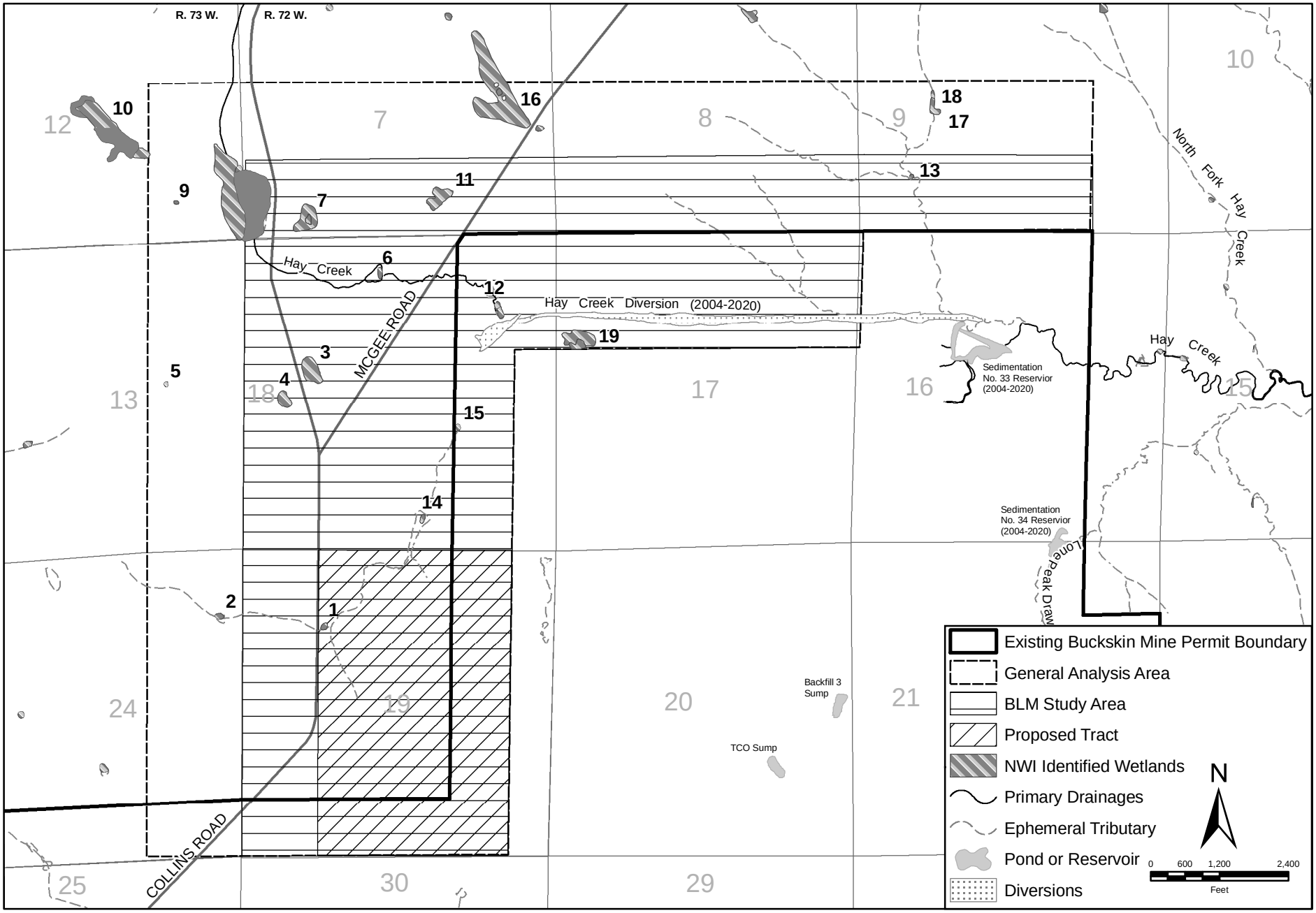
Wetland Name	NWI Wetland Classifications[1]	Wetland Type	Field Determination[2]	Acres
NWI 3	PEMA	Freshwater emergent wetland	Not a wetland (borrow pit)	2.58
NWI 4	PEMA	Freshwater emergent wetland	Not a wetland (borrow pit)	1.09
NWI 10	PABFh PEMA PEMAh	Freshwater emergent wetland and freshwater pond	Not a wetland	11.67
NWI 13	PEMC	Freshwater emergent wetland	Not a wetland (old impoundment)	0.10
NWI 16	PEMA PEMCx	Freshwater emergent wetland	Not a wetland (non irrigated hay field)	14.7
NWI 18	PEMCh	Freshwater emergent wetland	Not a wetland	0.16
NWI 19	PEMA PABFh	Freshwater emergent wetland and freshwater pond	Not a wetland (disturbed area)	3.44
Total Acres				33.74

NWI = National Wetland Inventory; P = palustrine; EM = emergent; AB = aquatic bed; A = temporarily flooded; F = semi-permanently flooded; C = seasonally flooded; x = excavated; h = diked/impounded

[1] Some of the wetlands studied had multiple wetland classifications associated with the wetland.

[2] Based on 2007 reconnaissance-level field visit or unrelated 2008 wetland delineation in the overlap between the general analysis area and existing permit area.

Source: USFWS 2007; Cowardin 1979.



No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by BLM.

Map 3.7-1

Wetlands and Other Waters in the General Analysis Area

A formal wetland survey for the portion of the general analysis area that is outside the current mine permit area will be completed as part of future permitting efforts. The specific functions (e.g., agriculture, livestock, and wildlife) of each identified wetland will be determined during that delineation process, and are, therefore, not addressed in detail as part of the EIS analysis.

Wetlands occur in a variety of forms in the general analysis area, with palustrine wetlands being the most common and abundant. Palustrine wetlands are defined by their close association with emergent herbaceous marshes, swales, or wet meadows and are supported by saturated soils along the banks of the drainages (Cowardin et al. 1979). Wetlands support a variety of vegetation types and occur mainly along drainages in the general analysis area. Hydrology for these areas is provided primarily by surface runoff from adjacent uplands and discharged CBNG waters.

Hay Creek, which flows primarily from the west to east, and several other tributaries that generally flow into Hay Creek, are waters of the U.S. These tributaries are primarily intermittent stream channels, open water, and other stream channels that carry water but do not meet the criteria for classification as wetlands. The Buckskin Mine's approved mining plan allows disturbance of a portion of the Hay Creek channel. Beginning in 2006, approximately 1.75 miles of the channel were diverted into the Hay Creek Diversion (map 3.5-3) to facilitate mining in the northern extent of the existing Buckskin Mine permit area. Additional details regarding water resources are provided in section 3.5.

Soils in the general analysis area consist mainly of loams, sandy loams, and some clay loams. One hydric soil unit, Felix Clay, is located in the general analysis area (NRCS 2008), on slopes ranging from 0 to 2% and in soils that are developing in alluvium derived from sandstone and shale on gently sloping uplands. The hydric soil unit is located near wetlands NWI 8 and NWI 9 (table 3.7-1). Section 3.8 contains additional information on soils in the general analysis area.

3.7.2 Environmental Consequences

3.7.2.1 Proposed Action

Under the Proposed Action, surface mining would have moderate, short-term impacts on two NWI inventoried wetlands for a total of approximately0.48 acre (NWI 1, table 3.7-3). One wetland (NWI1) within the proposed tract consists of a small, semi-permanently flooded, diked impoundment in the extreme northwestern corner of the proposed tract (map 3.7-1). However, field observations over the years have indicated that the reservoir is wet primarily during early spring months. A second wetland (NWI14) in the buffer area north of the proposed tract (table 3.7-3, map 3.7-1) would be affected by disturbance associated with mine support activities (e.g., topsoil stripping, stockpiling) described in section 1.1.3.3. All wetland functions would be lost during mining activities, but the general analysis area would experience no net loss of wetlands due to permit requirements to restore impacted sites. No additional reaches of Hay Creek would be diverted under the Proposed Action.

Table 3.7-3. Wetland Impacts under the Proposed Action and Alternative 2

Wetland Name	Proposed Action (Acres)[1]	Alternative 2 Acres [2]
NWI 1	0.24	0.24
NWI 12		0.58[3]
NWI 14	0.24[4]	0.24[4]
NWI 15		0.15[3]
NWI 17		0.68[4]
Total Acres	0.48	1.89

[1] Wetlands partially within the proposed tract were considered a full take, because a partial take of a wetland could affect the function of the entire wetland.

[2] NWI 2, NWI 5, NWI 6, NWI 7, NWI8, NWI 9, and NWI 11 are located in the operationally limited lands where mining activity is not anticipated to occur; therefore, Alternative 2 would not affect these wetlands. The remaining NWI inventoried wetlands were confirmed as non-wetlands during the 2007 site visit (table 3.7-2).

[3] Wetland is in overlap area between general analysis area and existing permit area, so impacts would also occur under No Action Alternative as a result of mine support activities described in section 1.1.3.3.

[4] Wetland is in buffer area; impacts would be a result of mine support activities described in section 1.1.3.3.

3.7.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of impacts on approximately 0.73 acre of two NWI inventoried wetlands (table 3.7-3, map 3.7-1) as a result of activities necessary to support mining on existing leases, described in section 1.1.3.3. A third NWI inventoried site (NWI19) in the overlap area was confirmed as a non-wetland during the 2007 site visit. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.7.2.3 Alternative 2

Under Alternative 2, surface mining could have moderate, short- to long-term impacts on up to 30.7 noncontiguous acres of 12 NWI inventoried wetlands. However, the greatest acreage is west of one or both county roads in the area considered operationally limited by Kiewit; Kiewit does not anticipate relocating either road to access coal reserves. Therefore, it is most likely that up to 1.89 noncontiguous acres of five NWI inventoried wetlands would be affected under this alternative (table 3.7-3). Four of these five NWI wetlands are located in the BLM study area and would be directly affected by mining coal reserves. The remaining site is in the 0.25-mile-wide buffer, which would be affected by mine support activities (e.g., topsoil stripping, stockpiling) described in section 1.1.3.3. All wetland functions would be lost during mining activities, but the general analysis area would experience no net loss of wetlands due to permit requirements to restore impacted sites. Kiewit does not expect to divert any additional segments of Hay Creek under Alternative 2 due to the location of the drainage in the operationally limited area west of the county roads.

3.7.3 Regulatory Compliance, Mitigation, and Monitoring

If an action alternative is implemented, a wetland delineation will be completed according to approved procedures (Environmental Laboratory 1987) and submitted to the Corps for verification of the amounts and types of jurisdictional wetlands and other waters present. Kiewit will mitigate for all impacted jurisdictional wetlands in accordance with Section 404 of the Clean Water Act. Mitigation is required at a minimum one-to-one ratio for jurisdictional wetlands. The wetland replacement plan, which must be approved by the Corps, requires no net loss of wetland area and function.

Section 404 of the Clean Water Act does not cover nonjurisdictional wetlands; however, Executive Order 11990 requires that all federal agencies protect all wetlands. Mitigation for impacts on nonjurisdictional wetlands will be specified during the permitting process as required by the authorized state or federal agency (which may include the WDEQ/LQD, and the OSM). Because surface land in the general analysis area is privately owned, the private surface owner may also contribute to decisions regarding mitigation for impacts on nonjurisdictional wetlands. The WDEQ/LQD allows and sometimes requires mitigation of nonjurisdictional wetlands, depending on the quality of the wetland functions. That agency may also require replacement of wetlands or playas with hydrologic significance.

Wetland mitigation may begin prior to mining activities, depending on hydrologic resources available. Interim mitigation may be provided through the many sediment-control structures (ponds) created during mining, drainage diversion, removal of livestock from riparian areas, and repair of damaged wetlands.

3.7.4 Residual Impacts

Replaced wetlands (jurisdictional or functional) may not duplicate the exact function and landscape features of the premining wetlands, but all wetland replacement plans will be approved by the Corps, which has special required permitting procedures to assure that no net loss of wetlands will occur after reclamation.

3.8 Soils

This section describes the affected environment as it relates to soils in the general analysis area, and identifies potential impacts on soils that would result from the Proposed Action and alternatives.

3.8.1 Affected Environment

The affected environment described in this section is based on National Resources Conservation District soil surveys of Campbell County, Wyoming, which includes the proposed tract and general analysis area (National Resources Conservation Service 2004).

Soils vary in composition and depth depending on where and how they were formed. Major factors involved in the formation of soils include whether the material was transported, the source of the material, and how the material was weathered after transportation. Five soil formation processes causing different soil types were noted in the general analysis area: 1) soils developing predominantly in alluvium (stream-laid) or eolian (wind-blown) deposits derived from sandstone and shale on upland ridges; 2) soils developing predominantly in alluvium derived from sandstone and shale on gently sloping uplands; 3) soils developing predominantly in alluvium or colluviums (material that has been transported downslope by rock falls, slides, and slumps) derived from porcelanite on gently sloping uplands; 4) soils developing predominantly in residuum (residual material)weathered from sandstone and shale on gently sloping uplands; and 5) soils developing predominantly in alluvium over residuum weathered from sandstone and shale on gently sloping uplands.

Soil surveys were conducted in 2007 by BKS Environmental Associates, Inc., to an Order 1-2 resolution. The inventories included field sampling and observations at the appropriate number of individual sites to provide adequate sample sizes, and analysis of representative collected samples. Soils in the general analysis area were identified by series, which consist of soils that have similar horizons (distinct horizontal layers) in their profile (sequence of soil layers). Soil types and depths in the general analysis area are similar to soils currently being salvaged and used for reclamation at the Buckskin Mine and other nearby mines in northern Campbell County. Additional detailed information about the soil types sampled during 2007 is included in the soils data report, which can be viewed at the High Plains District office of the BLM in Casper, Wyoming. These site-specific soil surveys located hydric (saturated) soils and inclusions of hydric soils, which are components used in identifying wetlands. Wetlands are discussed in section 3.7 of this EIS. Areas with soils that are not suitable to support plant growth include sites with high salinity (salty content), high sodicity (amount of sodium present), or excessive clay or sand content.

3.8.2 Environmental Consequences

3.8.2.1 Proposed Action

Under the Proposed Action, mining of the proposed tract would have a direct, permanent effect on soil resources in up to 419 acres. Impacts associated with mining support activities described in section 1.1.3.3 would occur in a buffer area to the north of the proposed tract. Soils removed during mining would be replaced under reclamation. The replaced soils would have a more uniform soil chemistry and soil nutrient distribution. Average topsoil quality would be improved because soil material that is not suitable to support plant growth would not be salvaged for use in reclamation. This would result in more uniform vegetative productivity on reclaimed lands.

The baseline soils analysis of the proposed tract indicates that the amount of suitable soil available for redistribution on disturbed areas would have an average depth of 17 inches (1.4 feet). The replaced soil would support a stable and productive vegetation community

adequate in quality and quantity to support the planned postmining land uses (i.e., wildlife habitat and livestock grazing).

Reclamation would result in a temporary increase in the near-surface bulk density of soils in the proposed tract. The average soil infiltration rates would generally decrease, which would increase the potential for runoff and soil erosion. Topographic moderation following reclamation, however, would potentially decrease runoff, which would tend to offset the effects of decreased soil infiltration capacity. The change in soil infiltration rates would not be permanent because revegetation and natural weathering would eventually form a new soil structure in the reclaimed soils. Infiltration rates would gradually return to premining levels. The reclaimed landscape would contain stable landforms and drainage systems that would support the postmining land uses. Reconstructed stream channels and floodplains would be designed and established to closely mimic preminng conditions and ensure proper drainage of water across the reclaimed spoils. Sediment-control measures would be implemented where runoff occurs to preserve reclaimed materials. Direct impacts on biological organisms in the soil on the proposed tract would include the short-term to long-term reduction in soil organic matter, microbial populations, seeds, bulbs, rhizomes, and live plant parts in soil resources that are stockpiled before replacement.

3.8.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.8.2.3 Alternative 2

Under Alternative 2, impacts would have a direct, permanent effect on soil resources impacts in up to 1,883 acres. Impacts would also occur in the 0.25-mile-wide buffer around the final tract configuration associated with mining support activities described in section 1.1.3.3. The amount of suitable soil available for redistribution on disturbed areas would have an average depth of 17 inches. Soils removed during mining would be replaced with a more uniform soil mixture during reclamation. The replaced soil would support a stable, productive, and more uniform vegetation community adequate in quality and quantity to support the planned postmining land uses (i.e., wildlife habitat and livestock grazing). Infiltration rates would gradually return to premining levels. Reconstructed stream channels and floodplains would be designed and established to closely mimic premining conditions and ensure proper drainage of water across the reclaimed spoils. Sediment-control measures would be implemented where runoff occurs to preserve reclaimed materials. Direct impacts on biological organisms in the soil on the proposed tract would include the short-term to long-term reduction in soil organic matter, microbial

populations, seeds, bulbs, rhizomes, and live plant parts in soil resources that are stockpiled before replacement.

3.8.3 Regulatory Compliance, Mitigation, and Monitoring

If either of the action alternatives is implemented, Kiewit will mitigate for the impacts on soil resources in accordance with WDEQ/LQD reclamation standards and requirements.

Soils suitable to support plant growth will be salvaged for use in reclamation. Soil stockpiles will be protected from disturbance and erosional influences. Soil material that is not suitable to support plant growth will not be salvaged; soil or overburden materials containing potentially harmful chemical elements (e.g., selenium) will not be used in reclamation. A minimum of 4 feet of suitable overburden will be placed on the graded backfill surface below the replaced soil to meet state guidelines for vegetation root zones; those depths will be confirmed by sampling before topsoil is applied. Redistributed topsoil will be sampled to document redistribution depths and seeded to reduce wind erosion. Sediment-control structures will be constructed, as needed, to trap eroded soil. Vegetation growth will be monitored in reclaimed areas to confirm vegetation establishment and acceptability for bond release and determine if soil amendments are needed. Appropriate normal husbandry practices may be implemented to achieve specific reclamation goals.

3.8.4 Residual Impacts

The action alternatives would result in long-term alteration of soil characteristics. Existing soils would be mixed and redistributed, and soil-forming processes would be disturbed by mining.

3.9 Vegetation

This section addresses existing vegetation in the general analysis area and impacts on vegetation resulting from the Proposed Action and alternatives. Wetlands are addressed in section 3.7. Threatened, endangered, proposed, and candidate plant species, and BLM Sensitive Species are addressed in appendices I and J, respectively.

3.9.1 Affected Environment

The affected environment for the general analysis areas is based on the following:

- Vegetation communities in the portion of the general analysis area that overlaps the existing Buckskin Mine permit area (656 acres) were mapped and quantitatively sampled during baseline inventories for a permit amendment in 2000. All field sampling and mapping efforts were conducted in accordance with WDEQ/LQD mine permitting requirements.
- Vegetation communities in the remainder of the general analysis area (2,191 acres) were mapped and quantitatively sampled in 2007 and 2008 (LandTrak Resources, Inc. 2009); those efforts also complied with WDEQ/LQD permitting requirements. Additional detailed

information about these survey methods and results is included in the soils data report, which can be viewed at the High Plains District office of the BLM in Casper, Wyoming.

Vegetation in the general analysis area consists of species common to eastern Wyoming and is consistent with vegetation that occurs in the existing Buckskin Mine permit area. Eight distinct vegetation communities were identified and mapped in the general analysis area. Four additional categories were also mapped: disturbed areas, tree shelterbelts, rough breaks, and open water. Each of the latter three groups accounts for less than 1% of the total area. All vegetation communities and additional classifications are described below. Table 3.9-1 provides acreages and percent composition for each category.

3.9.1.1 Agricultural Cropland

Agricultural Cropland in the general analysis area consists of dryland, small grain production and alfalfa hay production. The small grain production appears to use a fallow rotation cropping system. The alfalfa hay production is mostly dryland. Approximately 25.5 % (727.1 acres) of the general analysis area is Agricultural Cropland.

3.9.1.2 Agricultural Pasture

The classification system used for Agricultural Pasture—low management, moderate management, and intensive management—evaluates management efforts based largely on the presence of sagebrush.

Low Management

Low management Agriculture Pasture, which contains significant stands of old-growth sagebrush, is not present in the general analysis area.

Moderate Management

Moderate management Agriculture Pasture accounts for approximately 3.0% (86.2 acres) of the general analysis area. This vegetation community is largely a mixture of cool-season, introduced pasture grasses such as crested wheatgrass (*Agropyron cristatum*) and smooth brome (*Bromus inermis*). A minor component of cool-season native species is present, as well.

Some management of shrub species has occurred in this vegetation community. Typically, this vegetation community is hayed when sufficient moisture has occurred to make harvesting economically viable. In dry years, this community is used as early-season pasture for livestock production. If it is not hayed for several years, the sagebrush will become reestablished in this vegetation community.

Intensive Management

Intensive management Agricultural Pasture accounts for approximately 2.0% (56.1 acres) of the general analysis area. This vegetation community is located mostly along the edges of Agricultural Cropland. It is typically mowed annually to allow access to the cropland. This vegetation community is comprised almost exclusively of cool-season, introduced pasture

grasses such as crested wheatgrass and smooth brome. Frequent mowing prevents shrubs from becoming reestablished.

3.9.1.3 Bunchgrass Prairie Grassland

Bunchgrass Prairie Grassland accounts for approximately 8.2% (232.8 acres) of the general analysis area. This community typically occurs on scoria sandstone or shale hills, knolls, and slopes that are moderately steep to steep. Soils are predominantly in the Ironbutte, Fairburn, Mittenbutte, Samday, Shingle, and Rock Outcrop map units that have shallow soils and usually a high coarse-fragment content.

Vegetation species associated with Bunchgrass Prairie Grassland include: little bluestem (*Schizachyrium scoparius*), bluebunch wheatgrass (*Pseudoroegneria spicata*), Indian ricegrass (*Achnatherum hymenoides*), needle-and-thread (*Hesperostipa comata*), and some blue grama (*Bouteloua gracilis*). Some big sagebrush (*Artemisia tridentata*) occurs in this community, typically in small, mosaic patterns as described in the Big Sagebrush Shrubland category, below.

3.9.1.4 Lowland Prairie Grassland

Lowland Prairie Grassland accounts for approximately 4.4% (124.9 acres) of the general analysis area. This community occurs primarily on gently sloping, often saline plains: on gently sloping benches usually adjoining Riparian Bottomlands: and in closed basins. Within this community, the amount of soil saturation, concentration of soil salts, and presence or absence of subirrigation varies with topographic position. Salt concentrations in lowland prairie soils influence plant-available water, thus affecting vegetation composition. Soil salt accumulations play a part in limiting moisture in the subirrigated category of the lowland prairie vegetation community.

Transitional zones between soil water conditions in this community may be abrupt, or gradual and subtle, depending on local topographic and stormwater runoff conditions. Some portions of the lowland prairie benefit from periodic subirrigation which usually results in more robust growth of community vegetation. When present, subirrigation water tends to occur 16 inches below the ground surface. Soils are predominantly Boruff, Haverdad, and Felix series.

Vegetation species associated with Lowland Prairie Grassland include: western wheatgrass (*Pascopyrum smithii*), saltgrass (*Distichlis spicata*), prairie cordgrass (*Spartina pectinata*), streambank/thickspike wheatgrass (*Elymus lanceolatus*), and big sagebrush.

3.9.1.5 Mixed-Grass Prairie Grassland

Mixed-grass Prairie Grassland accounts for approximately 16.2% (462.6 acres) of the general analysis area. This community occupies rolling hills and ridges with moderate to deep soil development. Soils are predominantly loams, sandy clay loams, fine sandy loams, and sandy loams. Occasionally, clay loams and loamy sands are found in this community. This community is most strongly correlated with deeper soils, including Bidman, Cambria, Kishona, Lawver, Teckla, and Wibaux loams, and Hiland sandy clay loam.

Vegetation species associated with Mixed-grass Prairie Grassland include: western wheatgrass, Indian ricegrass, needle-and-thread, blue grama, and big sagebrush. When big sagebrush occurs in this community, it is typically in small, mosaic patterns and accounts for less than 20% of the total vegetation cover composition.

3.9.1.6 Sandy Prairie Grassland

Sandy Prairie Grassland accounts for approximately 16.0% (455.9 acres) of the general analysis area. This community occurs on rolling hills and plains, with occasional wind blow-outs. It is most commonly associated with fine sandy loams and sandy loams (e.g., Taluce, Terro, Vonalee, and Vonalf soils), but also occurs on loams, sandy clay loams, loamy sands, and fine sands. The soil series is generally is found on deeper soils; however, moderately deep soils are not uncommon.

Vegetation species associated with Sandy Prairie Grassland include: Indian ricegrass, needle-and-thread, blue grama, prairie sand reed (*Calamovilfa longifolia*), and threadleaf sedge (*Carex filifolia*).

3.9.1.7 Riparian Bottomland

Riparian bottomland accounts for approximately 6.1% (174.3 acres) of the general analysis area. This community is associated primarily with Hay Creek and is limited in distribution due to the drainage's narrow width throughout most of its length. In a few atypical instances, isolated Riparian Bottomland communities grow on hillsides in saturated soils associated with groundwater seeps.

Species composition in riparian bottomland varies, and is primarily correlated with site-specific hydrologic conditions. This community can be subdivided into two main sub-communities: Riparian Bottomland Meadow and Riparian Bottomland Marsh. Riparian Bottomland Meadow is the predominate sub-community found throughout Hay Creek. The most prevalent vegetation type is cordgrass, with minor inclusions of spikerush and bullrush. Riparian Bottomland Marsh and emergent vegetation zones exist around the perimeters of stockponds. The dominant vegetation types in this sub-community are bullrushes, spikerushes, and sedges. Rushes typically have a higher relative cover value than cordgrass in these areas. Production values for Riparian Bottomland sites can vary independently of cover values.

These bottomland communities typically occur on soils that are characteristically deep and poorly drained, including Boruff series and mollic fluvaquents.

3.9.1.8 Big Sagebrush Shrubland

Big Sagebrush Shrubland accounts for approximately 10.6% (302 acres) of the general analysis area. For purposes of this study, this community is defined as areas in which shrub and sub-shrub species comprise more than 20% of the total vegetation cover. Big Sagebrush Shrubland is found on a variety of topography, including gentle slopes, rolling hills and steep, dissected breaks. This community occurs commonly on shallow clay loams (such as the Theedle

and Shingle series) and deep loams (such as the Forkwood and Cushman series), and occasionally on sandy loams. This shrub community occurs in a mosaic pattern across the landscape. Individual shrub patches range from 0.3 acre to 27.0 acres, with 4.9 acres as the average area. The patches are loosely connected by narrow corridors of other vegetation communities (usually Mixed-grass Prairie or Lowland Prairie Grassland) with only a few shrubs present.

3.9.1.9 Disturbed Areas

In addition to surface mining, several other forms of disturbance are present in the general analysis area. Those combined features comprise approximately 7.2% (208.4 acres) of the area and include county roads, historic two-track roads, CBNG roads and infrastructure, residential sites, and other disturbance not related to mining.

3.9.1.10 Tree Shelter Belt

Most of the trees in the general analysis area are associated with residential disturbance. Due to their extremely limited presence, residential trees were included in the tree shelterbelt category. One stand of plains cottonwood (*Populus deltoids*) is present in the southeastern quarter of Section 19, T52N R72W. That area falls within the overlap between the general analysis area and existing Buckskin Mine permit area. This cottonwood stand encompasses approximately 0.03% (0.8 acre) of the general analysis area.

3.9.1.11 Rough Breaks

Rough Breaks refers to areas within the general analysis area where rock outcrops and badlands clay soils are associated with steep topography and limited vegetation. This category comprises 0.4% (12.5 acres) of the general analysis area.

3.9.1.12 Open Water

Open Water refers to water standing in reservoirs and stockponds in the general analysis area. Water bodies comprise 0.1% (3.4 acres) of the general analysis area.

Table 3.9-1. Vegetation Communities in the General Analysis Area

	General Analysis Area		BLM Study Area		Proposed Tract	
Vegetation Community	Acres	Composition (%)	Acres	Composition (%)	Acres	Composition (%)
Agricultural Cropland	727.1	25.5	532.9	28.3	39.3	9.4
Agricultural Pasture: Moderate Management	86.2	3.0	54.4	2.9	3.7	0.9
Agricultural Pasture: Intensive Management	56.1	2.0	56.1	3.0	12.0	2.8
Bunchgrass Prairie	232.8	8.2	160.8	8.5	0.0	0.0
Lowland Prairie	124.9	4.4	77.1	4.1	2.2	0.5
Mixed Grass Prairie	462.6	16.2	207.1	11.0	41.7	10.0

	General Analysis Area		BLM Study Area		Proposed Tract	
Vegetation Community	Acres	Composition (%)	Acres	Composition (%)	Acres	Composition (%)
Sandy Prairie	455.9	16.0	331.5	17.6	252.6	60.3
Riparian Bottomland	174.3	6.1	77.4	4.1	4.1	1.0
Big Sagebrush	302.0	10.6	202.8	10.8	45.8	10.9
Trees: Shelter Belt	0.8	0.03	0.8	0.04	0.9	0.2
Disturbed: Roads	46.4	1.6	37.5	2.0	9.5	2.3
Disturbed: CBNG	41.0	1.4	19.1	1.0	7.0	1.7
Disturbed: Residential	20.4	0.7	20.4	1.1	0.0	0.0
Disturbed: Other Non-Mining	11.9	0.4	9.0	0.5	0.0	0.0
Disturbed: Mining	88.7	3.1	88.7	4.7	0.0	0.0
Rough Breaks	12.5	0.4	5.0	0.3	0.0	0.0
Open Water	3.4	0.1	2.0	0.1	0.0	0.0
Total[1]	2,847.0	100.0	1,883.0	100.0	419.0	100.0

CBNG = coal bed natural gas

[1] Totals are rounded.

Source: LandTrak Resources, Inc. 2009.

3.9.2 Environmental Consequences

Impacts on wetlands and wildlife/livestock relative to vegetative disturbance are discussed in section 3.7 and section 3.10, respectively.

3.9.2.1 Proposed Action

Under the Proposed Action, native vegetation would be temporarily and incrementally removed from the entire proposed tract (419 acres). Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance in a buffer area to the north of the proposed tract. This alternative would have the greatest impact on the Sandy Prairie Grassland community, because it is most prevalent (252.6 acres, 60.3%) in the proposed tract (table 3.9-1). Six of the remaining seven vegetative communities would also be affected, though to a considerably lesser degree. Some previously disturbed areas and one shelterbelt would be affected in the proposed tract, but no rough breaks or open water bodies would be affected. Mining support activities (described in section 1.1.3.3) would cause additional temporary surface disturbance a buffer area north of the proposed tract.

One stand of plains cottonwood (*Populus deltoides*) is present in the southeastern quarter of the proposed tract, in section 19, T52N R72W. This shelter belt encompasses approximately 0.2% (0.8 acre) of the proposed tract, and lies within the overlap between that area and the existing Buckskin Mine permit area. Consequently, the tree stand is already subject to future disturbance associated with previously permitted mining activities. Disturbance in the Agricultural Cropland and Agricultural Pastureland (13.1% of the total acreage, combined) would likely disrupt one landowner's ranching and farming operation.

Impacts associated with the removal of vegetation from the proposed tract and surrounding buffer could include increased soil erosion and differences between premining and postmining vegetative communities. Because the proposed tract is dominated by upland grasslands, the transition from native to reclaimed grasslands would be less dramatic and species composition would be expected to be more similar to premining communities. Vegetation loss and subsequent reclamation would likely occur incrementally across the proposed tract, depending on the direction and rate of mining. Impacts on vegetation from topsoil stripping and other mine-related activities would be addressed in accordance with the WDEQ/LQD approved mining and reclamation plan.

3.9.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary and incremental impacts on vegetation from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Vegetation loss and subsequent reclamation would likely occur incrementally across the currently permitted disturbance area, depending on the direction and rate of mining. The cottonwood trees in the overlap area would eventually be disturbed under previously permitted mining activities. Impacts on vegetation from topsoil stripping and other mine-related activities would be addressed in accordance with the WDEQ/LQD approved mining and reclamation plan.

3.9.2.3 Alternative 2

Under Alternative 2, native vegetation would be temporarily and incrementally removed over an area of up to 1,883 acres. Mining support activities described in section 1.1.3.3 would cause temporary surface disturbance within a 0.25-mile-wide buffer around the final tract configuration. This alternative would have the greatest impact on Agricultural Cropland, because it is most prevalent (727.1 acres, 25.5%) in the general analysis area (table 3.9-1). Each of the remaining seven vegetation communities and all four of the additional habitat classifications in the general analysis area could also experience some level of disturbance. The extent of that disturbance would range from 0.1 to 16.2% on individual habitat types, with the majority of combined impacts on agricultural lands and upland grasslands (table 3.9-1).

As described in section 3.9.1.9, three groups of trees (primarily cottonwoods) occur in the general analysis area; the shelter belt within the existing permit area is already subject to disturbance from previously permitted activities. Disturbance in the Agricultural Cropland and Agricultural Pastureland (30.5% of the total acreage, combined) would likely disrupt one landowner's ranching and farming operation.

Impacts associated with the removal of vegetation from the 0.25-mile-wide buffer could include increased soil erosion and differences between premining and postmining vegetative communities. The latter impacts would be reduced due to the similarity between premining and postmining vegetation. Vegetation loss and subsequent reclamation would likely occur incrementally across the final tract configuration, depending on the direction and rate of mining. Impacts on vegetation from topsoil stripping and other mine-related activities would be addressed in accordance with the WDEQ/LQD approved mining and reclamation plan. As noted, section 3.10 discusses indirect impacts on wildlife and livestock related to changes in vegetation. Mining activities under this alternative would not have impacts on trees within residential disturbance areas, unless Kiewit acquires the surface rights for those homes; the company does not intend to pursue that option.

3.9.3 Regulatory Compliance, Mitigation, and Monitoring

If either action alternative is implemented, reclamation, including revegetation, will immediately follow as mining progresses through the area. Estimates of the time elapsed from topsoil stripping through reseeding of any given area range from two to five years. This would be longer for areas occupied by stockpiles, haul roads, some sediment-control structures, and other mine facilities. Some roads and facilities would not be reclaimed until all coal removal has ended and active operations have ended. No new life-of-mine facilities would be built in the proposed tract or the final tract configuration, because in either case the tract would be mined as an extension of the existing mine. By the time mining ceases, more than 75% of disturbed lands will be reseeded. The remaining 25% will be reseeded during the subsequent two to three years as the life-of-mine facilities area is reclaimed.

Reclamation will approximate premining vegetation, and reestablished vegetation will primarily consist of native species except were agricultural lands occur. Areas reclaimed for native species will be revegetated as specified in the approved mine plan using reclamation seed mixtures approved by the WDEQ/LQD. Those efforts will likely focus on a mixture of upland prairie grasslands with graminoid/forb-dominated areas to simulate the dominance of upland grasslands in the premining landscape.

Initially, reclaimed lands will be dominated by grassland vegetation, which may be less diverse than the native premining vegetation, but more diverse than agricultural areas. At least 20% of the native vegetation area will be reclaimed to native shrubs at a density of one per square meter or as required by current regulations. Shrubs will be selectively planted in riparian areas and trees will be replaced at a one-to-one ratio. Estimates for the time it will take to restore shrubs, including sagebrush, to premining density levels range from one or two decades to up to 100 years. Native vegetation from surrounding areas would enhance reclamation activities through natural seed dispersal. The reclamation plan for the final tract configuration will include steps to control invasive, nonnative plant species.

Revegetation growth and diversity will be monitored until the final reclamation bond is released (a minimum of 10 years). Erosion will be monitored to determine if corrective action is needed

during establishment of vegetation. Controlled grazing will be used during revegetation as a management tool and to determine the suitability of the reclaimed land for postmining land uses. Following completion of reclamation (seeding with the final seed mixture) and before release of the reclamation bond, a permanent, diverse, and productive vegetative cover would be established throughout the disturbance area. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and rangeland) should be achieved even with the changes in vegetation composition and diversity.

Reclamation of agricultural pastures and croplands may occur, but is highly dependent on the postmine topography and landowner agreements. It is most likely that agricultural lands will be reclaimed to pastures suitable for either haying or livestock rather than croplands. Such areas will be reclaimed using a seed-mix of native grass and legume species. Agricultural croplands will be reseeded to either annual cereal grain, such as winter wheat, or to hayland with a legume such as alfalfa. Again, reclamation of cropland is dependent on postmine topography and soil suitability for crop production. Following reclamation bond release, management of the privately owned surface areas would revert to the private surface owners, who would have the right to manipulate the reclaimed vegetation.

Revegetation success and patterns in reclaimed areas would be at least partially affected by the influence of postmining topography on surface water drainage patterns. For example, the maximum postmining overland slope would be 20%, in accordance with WDEQ/LQD policy. However, the average reclaimed overland slope would not be known until the technical review of the permit revision application has been completed by the WDEQ/LQD. Although no significant changes in the average overland slope are predicted once reclamation is complete, the location and orientation of individual slopes could influence the direction and amount of runoff from rain and snow events, which could then result in different rates of vegetative reestablishment throughout reclamation.

The climatic record of the western U.S. suggests that droughts could occur periodically during the life of the mine. Such droughts could severely hamper revegetation efforts, because lack of sufficient moisture would reduce germination and could damage newly established plants. Severe thunderstorms could also adversely affect newly seeded areas. Same-aged vegetation would be more susceptible to disease resulting from increased vulnerability during periods of water stress (too little or too much) than plants of various ages. Once a stable vegetative cover is established, the impact of these events would be similar to impacts on native vegetation.

Restoration of wetlands is discussed in section 3.7; monitoring of livestock grazing standards is discussed in section 3.10.

3.9.4 Residual Impacts

Reclaimed vegetative communities may never completely restore the preming native plant community. Immediately following reclamation, revegetated areas would be characterized primarily by a mixture of upland prairie grasslands with graminoid/forb-dominated areas, which does resemble the current dominant community. An overall reduction in species diversity,

especially for the shrub component, could occur. The decrease in plant diversity would not seriously affect the potential productivity of the reclaimed areas, and the proposed postmining land use (wildlife habitat and livestock grazing) should be achieved even with the changes in vegetation composition and diversity. No net loss of jurisdictional wetlands would occur due to restoration requirements of the Corps (section 3.7). Any wetlands serving as stockponds or other agricultural uses would be restored in accordance with the requirements of the surface landowner.

3.10 Wildlife

This section describes the affected environment as it relates to wildlife in the general analysis area and impacts on various species of wildlife and wildlife habitat that would result from the Proposed Action and alternatives.

3.10.1 General Setting

Section 3.1, section 3.2, and section 3.9 provide detailed descriptions of the general setting, topography, and vegetative composition, respectively, of the general analysis area. The most pertinent information for wildlife is summarized here for reference.

The terrain in the general analysis area consists primarily of gently sloping uplands and relatively level agricultural fields, with more rugged terrain in the northeastern portion of the area. Elevations in the general analysis area range from approximately 4,080 to 4,380 feet above mean sea level.

Predominant wildlife habitat types classified in the general analysis area broadly correspond with the major plant communities defined during the vegetation baseline study. The proposed tract is dominated (approximately 71%) by various upland grassland habitats (table 3.9-1). Habitats in the general analysis area are comprised primarily (71%) of upland grasslands (approximately 40%) and agricultural lands (croplands and pastures, 31%). A map showing the distribution of vegetative communities throughout the general analysis area is included in the wildlife data report, which can be viewed at the BLM High Plains District Office in Casper, Wyoming.

For this EIS, Big Sagebrush Shrublands are defined as vegetation communities where shrub and sub-shrub species comprise more than 20% of the total vegetation cover. This habitat type makes up less than 11% of both the proposed tract (approximately 46 noncontiguous shrub acres) and surrounding general analysis area (approximately 302 noncontiguous shrub acres). The shrub community is dominated by big sagebrush and occurs in a broken mosaic pattern across the landscape. Individual shrub patches range from 0.3 acre to 27.0 acres, with 4.9 acres as the average area. The patches are loosely connected by narrow corridors of other vegetation communities (usually Mixed-grass Prairie or Lowland Prairie), with few shrubs present. Other habitats present to a limited extent in the general analysis area include Riparian Bottomlands, Rough Breaks, Open Water, Tree Shelter belts, as well as previously disturbed areas (roads, pipelines, oil and gas storage tank complexes, and well pads).

No major drainages pass through the proposed tract itself, though a closed, unnamed drainage system crosses its northwestern corner (map 3.5-3). Hay Creek flows from west to east through the northern half of the general analysis area, with a considerable portion passing through the existing Buckskin Mine permit area. Several primary and secondary tributaries are also in that area. Under natural conditions, Hay Creek and all tributaries in the area are considered ephemeral (i.e., respond only to rainfall or snowmelt events). The determination of stream classification was made using the flume monitoring data collected by the Buckskin Mine and reported in the existing permit document. Additional information regarding groundwater and surface water in the general analysis area is presented in section 3.5.

CBNG discharge water has increased the frequency and duration of streamflow events in some portions of the general analysis area. The USFWS NWI maps (2007) show one small wetland (a 0.24-acre, semi-permanently flooded, diked impoundment) in the extreme northwestern corner of the proposed tract (map 3.7-1); however, field observations over the years have indicated that it is wet primarily during early spring months. One playa and one small instream impoundment are in the northwestern portion of the surrounding general analysis area. Those features are also seasonal, with water typically present in spring but dry by mid- to late summer. The playa is the only water body in the general analysis area that provides habitat for waterfowl, shorebirds, and other aquatic species. Due to its limited availability, it serves primarily as a staging area during spring migrations. Additional information regarding these water features is provided in section 3.5 and section 3.7. Due to the lack of permanent water sources, the general analysis area does not support any fisheries; fish species are, therefore, not discussed in this EIS.

As described in section 1.1.3, a variety of ongoing mining and reclamation support activities occur in the overlap between the general analysis area and existing permit area. Mine operations and facilities throughout the rest of the existing permit area include storage silos, coal crushing and preparation plants, and a railroad spur and loading facility, among others. These activities often involve variety of heavy equipment and occur 24 hours per day, every day of the year. Blasting occurs during daylight hours on a nearly daily basis. Disturbance and reclamation activities occur incrementally through the area. Because the mine operates at night, artificial lighting is present in active pit areas and on haul roads to ensure the safety of mine employees.

3.10.2 Survey Requirements and History

Long-term information on species occurrence and habitat use in the general analysis area was based primarily on results from annual wildlife monitoring surveys conducted for the existing Buckskin Mine over the past 25 years (1984 through 2008). The extent of these surveys was based on guidance from Appendix B of the WDEQ/LQD Coal Rules and Regulations, and included multiple seasons, depending on the species and requirements in place at the time. Appendix B specifies that annual wildlife monitoring surveys for larger, wide-ranging species at existing surface coal mines include the permit area and the area within a 0.5- to 2-mile radius, depending on the species. Surveys for smaller, less mobile species (e.g., small mammals and rabbits) or species with small breeding territories (e.g., breeding birds) are limited to the permit area only. Guideline 5 of those rules and regulations recommends that the survey area for

wildlife baseline inventories include the area that would be disturbed as a result of mining plus up to a 2-mile- radius, again depending on the species. Those baseline and annual monitoring survey areas were developed in collaboration with the WGFD and USFWS, the primary agencies responsible for regulating wildlife on non-federal surface in Wyoming.

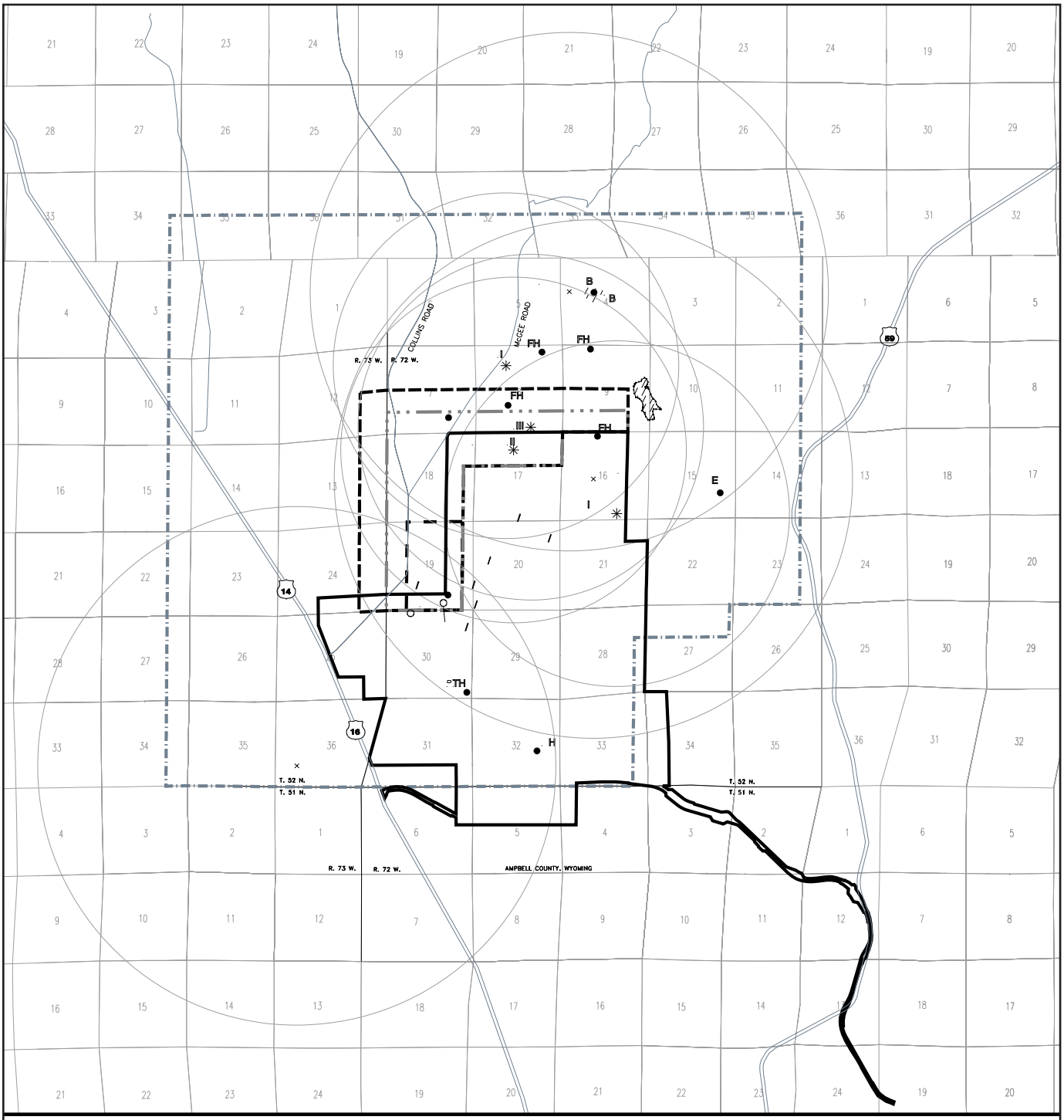
The BLM Data Adequacy Standards for the Powder River Coal Region (BLM 1987) describe the minimum data requirements needed to make coal leasing recommendations for wildlife populations and their habitats within the PRB Coal Production Region. Because most coal mines in the PRB have collected long-term annual monitoring data for a wide variety of vertebrate species as part of their WDEQ/LQD permit requirements, and because most surveys include lands outside the current permit area, the BLM typically accepts that information as meeting the minimum requirements of these standards. The long-term (25 years) database available for the Buckskin Mine permit area and surrounding lands meets those minimum requirements.

Guideline 5 and the BLM Data Adequacy Standards both call for up to a 2-mile radius for some species surveys. Therefore, the long-term data provided for this EIS analysis included the general analysis area and the area within a surrounding 2-mile radius (map 3.10-1). Because of its elevated level of concern in recent years, a 3-mile radius was used for sage-grouse leks (map 3.10-1). The 3-mile radius is the area in which two-thirds of the hens that were bred at those leks would be expected to nest.

Information for each major group of vertebrate species is provided in the following subsections. Supporting data and a vegetation distribution map for the general analysis area are included in the wildlife data report, which can be viewed at the BLM Wyoming High Plains District Office in Casper, Wyoming.

Due to their proximity to the existing Buckskin Mine permit area, the entire proposed tract and the southern third (33%) of the general analysis area have been included in annual wildlife surveys for the last 25 years (1984 through 2008). Approximately 95% of the general analysis area has been surveyed annually for the last seven years (2002 through 2008) in conjunction with a previous permit amendment at the mine. The entire general analysis area and expanded adjacent lands were included in targeted baseline surveys conducted for the LBA process from late 2007 through 2008.

Supplemental information on species occurrence and habitat use in the general analysis area was obtained from several sources, including: baseline inventories conducted at the Buckskin Mine from1977 through 1979 (original study), in 1988 (Spring Draw tract), and from early 1999 through early 2000 (original Hay Creek amendment); annual wildlife monitoring reports submitted to the WDEQ/LQD by the Buckskin Mine and overlapping Eagle Butte and Rawhide mines from 1984 through 2008; the *Final Eagle Butte Environmental Assessment* (BLM 1994); the *Final South Powder River Basin Coal EIS* (BLM 2003); the *Final EIS for the West Hay Creek Coal Lease Application* (BLM 2004); the *Final EIS for the Eagle Butte West Coal Lease Application* (BLM 2007c); and from BLM, WGFD, and USFWS records and contacts in 2007 and 2008.



Raptor Nest – Intact

Raptor N F 'te

Sharp–T 'led Grouse Le< 'ed meter

Sage–Grouse Le< 'ed meter

B B 'es
FH F 'nous Hawk
GE Golden Eagle
GH Great Horned Ow
H Northern H 'er
RTH R 'led Hawk
SEO Short–eared Owl
SH Sw 'nson's Hawk

Bucks<'n M'ne P 't Boundary

-eneral Analysis Area

Proposed Tra -

PLM -udy Area

2–M'le W' fe Survey P 'meter

P ' e Dog Colony

County Road

State H'ghway

N

0 5,000 10,000
feet

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.10-1

Raptor Nests and Grouse Leks in the Wildlife Survey Area

3.10.3 Big Game

3.10.3.1 Affected Environment

No crucial big game habitat or migration corridors are recognized by the WGFD in the general analysis area, or elsewhere in the coal mine region of the PRB. Crucial range is defined as any particular seasonal range or habitat component that has been documented as the determining factor in a population's ability to maintain and reproduce itself at a certain level.

The pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) are the only two big game species ever recorded in the general analysis area. No white-tailed deer (*Odocoileus virginianus*) or elk (*Cervus elaphus*) have ever been observed in that area, though both species have rarely been seen within 2 to 3 miles of the general analysis area. The pronghorn is the most common big game species in the general analysis area. However, because the area is dominated by upland grasslands and agricultural lands (71%, combined), this species is not usually observed in great numbers. Pronghorn are most often associated with sagebrush communities, particularly in winter (Sundstrom et al. 1973; Fitzgerald et al. 1994); Big Sagebrush Shrublands comprise less than 11% of both the proposed tract and general analysis area.

The WGFD has classified the habitat in the vicinity of the Buckskin Mine as a mix of yearlong and winter/yearlong pronghorn range. Both range types describe areas where a population or substantial portion of a population of animals makes general use of the habitat on a year-round basis. In yearlong range, pronghorn may occasionally leave the area under severe conditions. In winter/yearlong range, the area receives a predictable and significant influx of additional animals from other seasonal ranges in the winter. The entire general analysis area is within the WGFD's Gillette herd unit. In post-season 2007, the WGFD estimated that population to be 16,823 animals, with an objective of 11,000 (WGFD 2008a). The home range for pronghorn can vary between 400 acres to 5,600 acres. Several factors influence pronghorn movements, including season, habitat quality, population characteristics, water availability, and local livestock occurrence. Typically, daily movement does not exceed 6 miles. Pronghorn may make seasonal migrations between summer and winter habitats, but migrations are often triggered by availability of succulent plants and not local weather conditions (Fitzgerald et al. 1994). As noted above, no big game migration corridors have been documented in the general analysis area.

Mule deer use a wide variety of habitats, but typically prefer sagebrush-grassland, rough breaks, and riparian bottomland. As described, those habitats are limited throughout the general analysis area. Browse is an important component of the mule deer's diet throughout the year, comprising as much as 60% of total intake during autumn, while forbs and grasses typically make up the rest of their diet (Fitzgerald et al. 1994). This species tends to be migratory in certain areas of the state, traveling from higher elevations in the summer to winter ranges that provide more food and cover. The WGFD has classified the region surrounding the Buckskin Mine as a mix of yearlong and winter/yearlong range for mule deer. The entire area is located within the WGFD's Powder

River mule deer herd unit. The agency estimated the 2007 post-season mule deer population for the herd unit at 49,560, which was below the current objective of 52,000 (WGFD 2008a).

White-tailed deer are generally managed separately by the WGFD in the Central herd unit. This deer species prefers treed riparian habitats; no such habitats occur in the general analysis area. The agency classifies nearly the entire area as out of the normal white-tailed deer use range. The nearest known habitat for this species is located in the cottonwood corridor along the Dry Fork Little Powder River, approximately 2 miles east of the general analysis area. White-tailed deer have rarely been recorded outside of that corridor.

A resident elk herd lives in the Rochelle Hills located several miles southeast of the general analysis area. Elk do wander from the protection of the Rochelle Hills to forage in native and reclaimed grasslands at some mines in the central and southern parts of the PRB but they have only rarely been documented within a few miles of the Buckskin Mine. None of the areas considered in this EIS are classified by the WGFD as within normal elk use range.

3.10.3.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have short-term, minor to moderate impacts on big game species; however, ongoing impacts, described above under “Affected Environment” would continue for two years beyond the current life-of-mine estimate. Some big game animals would be displaced from portions of the proposed tract to adjacent habitats during mining. Because they are more prevalent, pronghorn would be most affected. However, long-term (since 1984) monitoring at the Buckskin Mine has demonstrated that pronghorn are more common in sagebrush shrubland habitats south of the existing Buckskin Mine permit area than in the grasslands that dominate the general analysis area. Similarly, mule deer would experience few impacts, given their infrequent use of these lands and the availability of suitable habitat in adjacent areas that would remain undisturbed by mining. No white-tailed deer or elk are present in the general in the general analysis area, so the Proposed Action would have no impact on them.

Big game displacement would be temporary and incremental, occurring over several years and allowing for gradual changes in distribution patterns. Big game living in the areas adjacent to the proposed tract could be adversely affected by increased competition from displaced animals. Noise, dust, and associated human presence would cause some foraging areas adjacent to mining activities to be avoided. However, pronghorn and mule deer have continued to occupy areas adjacent to and within active mining operations, suggesting that some animals do become habituated to such disturbances.

Big game animals are highly mobile and can move to undisturbed areas. The construction of additional fences, spoil piles, and pits related to mining would likely restrict big game movement on or through the proposed tract to some degree. Pronghorn may not be able to negotiate these

barriers during severe winter storms. However, WDEQ guidelines require fencing that is designed to permit passage of pronghorn and other big game species to the extent possible.

Changes in big game carrying capacity are not likely to be significant given the relatively low level of big game use in the area and the current dominance of upland grassland and agricultural habitats in potential impact areas. Mule deer have regularly been documented in reclaimed grasslands at the adjacent Buckskin Mine and elsewhere in the PRB. Eventual restoration of sagebrush and other shrub species would facilitate pronghorn use of reclaimed mine lands over time.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on big game and their habitat in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area, and would consist of the short-term, minor to moderate impacts described for the Proposed Action as a result of activities necessary to support mining on existing leases, as described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration would have short-term, minor to moderate impacts on big game. Impacts would be the same as or similar to those described under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats for big game, respectively, compared to those in the premining landscape.

Long-term monitoring conducted at the Buckskin Mine has demonstrated that pronghorn are not common in the grasslands and agricultural lands that dominate the general analysis area. Mule deer are even less abundant in this area; both species use suitable habitat in adjacent areas that would not be affected by either action alternative. No white-tailed deer or elk would be impacted under Alternative 2.

3.10.4 Other Mammals

3.10.4.1 Affected Environment

A variety of small and medium-sized mammal species may occur in the general analysis area. Some predators that could be present include the coyote (*Canis latrans*), red fox (*Vulpes vulpes*), bobcat (*Lynx rufus*), striped skunk (*Mephitis mephitis*), long-tailed weasel (*Mustela frenata*), and badger (*Taxidea taxus*). Prey species include various rodents (e.g., mice, rats, voles, gophers,

ground squirrels, and chipmunks), cottontails (*Sylvilagus* spp.), and jackrabbits (*Lepus* spp.). These prey species are cyclically common and widespread throughout the region and are important food sources for raptors and other predators.

Because water is extremely limited, species such as the muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), and beaver (*Castor canadensis*) are uncommon in both the proposed tract and general analysis area. Woodland species such as porcupines (*Erethizon dorsatum*) and bats (e.g., hoary [*Lasiurus cinereus*] and big brown [(*Eptesicus fuscus*]) also have little habitat in the general analysis area. Few of those species have been recorded in the area during the last 25 years of annual monitoring, and those that were observed were not seen with any regularity.

The black-tailed prairie dog (*Cynomys ludovicianus*) is a BLM sensitive species for the Buffalo Field Office due to its periodic occurrence in the federal listing process under the Endangered Species Act (ESA) of 1973, as amended. No prairie dog colonies occur in the proposed tract or general analysis area. The nearest colony is approximately 80 acres in size and is located in a narrow valley on the far side of a ridge that marks the northeastern extent of the general analysis area (map 3.10-1). This species was added as a candidate for federal listing under the ESA on February 4, 2000. The USFWS removed it from the candidate species list on August 12, 2004. On December 2, 2008, the USFWS announced a 90-day finding on a renewed petition seeking federal protection for the black-tailed prairie dog under the ESA; the finding indicated that listing as threatened or endangered may be warranted (*Federal Register*, Volume 73, No. 232, page 73211). The USFWS concurrently announced initiation of a 12-month status review to determine if listing the species is warranted. That agency continues to encourage the protection of prairie dog colonies for their value to the prairie ecosystem and the myriad of species that rely on them during this review process. Because neither action alternative would affect this species, no further discussion is provided for the black-tailed prairie dog in this section.

3.10.4.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have short-term, moderate impacts on small- and medium-sized mammals (e.g., lagomorphs, coyotes, and rodents) due to their ability to quickly recolonize reclaimed lands and the high reproductive potential of most of these species. Disturbance would be temporary and incremental. However, ongoing impacts described above, under “Affected Environment,” would continue for two years beyond the current life-of-mine estimate. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Medium-sized mammals could be directly impacted by collisions with mine-related vehicles or traffic. Species inhabiting disturbed areas would be temporarily displaced to other habitats by mining, potentially resulting in increased competition and mortality, if those habitats are already

at their carrying capacity. These populations would rebound as vegetation is reestablished or small mammal prey species recolonize reclaimed areas. Direct losses of small mammals would be higher than for other wildlife because their mobility is more limited and many retreat into burrows when disturbed. Populations of prey animals such as mice, voles, and ground squirrels would decline during mining. However, these animals have a high reproductive potential and tend to reoccupy and adapt to reclaimed areas quickly. Results from research projects on small mammal use of reclamation conducted on mined lands in the Wyoming and Montana PRB have indicated that reclamation objectives to encourage recolonization by small mammal communities are being achieved (Clayton et al. 2006; Shelley 1992). No prairie dog colonies or reliable water sources are present in the proposed tract. The only trees in the proposed tract overlap the general analysis area and are, therefore, expected to be affected in the absence of the Proposed Action. Consequently, no prairie dogs, or species dependent upon water (e.g., muskrats) or woodlands (e.g., porcupines) would be affected under this alternative that would not be affected under the No Action Alternative.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on small- and medium-sized mammals and their habitats in the general analysis area would be short-term and moderate. Disturbance would occur incrementally and would be limited to the overlap between the general analysis area and the existing Buckskin Mine permit area, and would be associated with activities necessary to support mining on existing leases, as described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration would have short-term, moderate impacts on small- and medium-sized mammals. Impacts would be the same as or similar to those described under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate. Because the general analysis area is dominated by upland grassland communities and agricultural lands (71% combined), the establishment of reclaimed grasslands after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to those in the premining landscape. No prairie dog colonies, or species dependent upon water (e.g., muskrats) or woodlands (e.g., porcupines) would be affected under this alternative that would not be affected under the No Action Alternative.

3.10.5 Raptors

3.10.5.1 Affected Environment

Map 3.10-1 shows the locations and physical status of raptor nests identified the general analysis area and baseline survey area for the Buckskin Mine since annual monitoring began at Buckskin and the adjacent mines; the survey areas for adjacent mines overlap that of Buckskin. Over time, new nests have been built, and natural forces have destroyed many nests; others have been relocated for mitigation or removed by mining activities. In some cases, new nests have been created to mitigate the loss of other sites impacted by mining operations. Eight intact raptor nests were present in the baseline survey area for raptors in 2008; only three were present in the general analysis area (map 3.10-1). Numerous intact and former nest sites are present elsewhere in the baseline survey area, beyond the general analysis area. Because these nest sites would not be affected by the Proposed Action or Alternative2, they are not discussed further in this section.

Raptor species that have historically been documented in the general analysis area include the golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*Buteo swainsoni*), rough-legged hawk (*Buteo lagopus*), northern harrier (*Circus cyaneus*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), great horned owl (*Bubo virginianus*), and short-eared owl (*Asio flammeus*). These species are year-round residents, seasonal visitors, or migrants, depending on the species. Burrowing owls (*Athene cunicularia*) could nest in old badger burrows, but they have not been recorded doing so in the area to date. Raptor species such as the northern goshawk (*Accipiter gentilis*), screech owl (*Megascops* spp.), and peregrine falcon (*Falco peregrinus*) are generally precluded due to the lack of appropriate habitats such as dense coniferous forests and riverine cliffs; those species have never been recorded in the general analysis area or at the adjacent Buckskin Mine.

Bald eagles and rough-legged hawks both occur in the vicinity of the Buckskin Mine during winter. The bald eagle is a migrant and common winter resident of the PRB, but is not common in general analysis area. Sightings in the general analysis area and at the adjacent Buckskin Mine have not been made with any regularity and have typically been limited to one or two individuals at a time. Both species occasionally perch in the small grove of trees in the southeastern corner of the proposed tract where it overlaps with the existing permit area and, therefore, are likely to be exposed to disturbance under existing conditions.

On July 9, 2007, the USFWS published a *Federal Register* notice (Volume 72, pages 37346–37372) announcing that the bald eagle would be removed from the list of threatened and endangered species under the ESA; delisting was effective August 8, 2007. However, the protections provided to the bald eagle under the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act will remain in place. The bald eagle is recognized as a BLM sensitive species due to its former listed status and is further discussed in appendix J of this EIS.

The red-tailed hawk and great horned owl are the only two raptor species that nest with any regularity in the general analysis area, including in the proposed tract (map 3.10-1). The golden

eagle and short-eared owl have infrequently nested in the general analysis area over time. One pair of Swainson's hawks has periodically built a nest just outside the general analysis area but has never laid eggs. Although nest structures typically associated with ferruginous hawks have been found in the general analysis area, no active nests have been documented during 25 years of annual monitoring. As described previously, habitat is limited or absent for those species that nest exclusively in trees, on cliffs, or in prairie dog colonies. Several pairs of red-tailed hawks and great horned owls have adapted to nesting on mine highwalls and facilities such as coal crushers, silos, and other load-out structures at multiple coal mines in the PRB in recent years. The USFWS does not require mitigation for such nest sites at surface coal mines in northeast Wyoming due to the fact that disturbance activities were ongoing and continuous when raptors arrived to begin nesting.

3.10.5.2 Environmental Consequences

Table 3.10-1 presents the potential impacts on raptor nest sites (intact and former) under each alternative.

Table 3.10-1. Potential Impacts on Raptor Nest Sites[1] (Intact and Former) in the General Analysis Area (through 2008) Under the Proposed Action and Alternatives

Species	Alternative 1 (No Action)[2]	Proposed Action	Alternative 2[3]
INTACT NESTS			
Red-tailed hawk	0	0	1
Red-tailed hawk/great horned owl	1	1	1
Ferruginous hawk	0	0	1
Total Intact Nests	1	1	3
FORMER NEST SITES			
Red-tailed hawk/great horned owl	2	2	2
Red-tailed hawk/golden eagle	1	1	1
Golden eagle	1	1	1
Short-eared owl	2	0	2
Total Former Nest Sites	6	4	6

[1] Rows are not summed across.

[2] Nests within the overlap between the general analysis area and existing Buckskin Mine permit area only.

[3] Nest(s) within the general analysis area only (nest number based on maximum potential area of disturbance associated with leasing action).

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have no new impacts on known raptor nest sites. One intact nest and four former nest sites are present in the

proposed tract (map 3.10-1, table 3.10-1); however, all five nest sites are in the tree grove that overlaps the existing Buckskin Mine permit area and would eventually be disturbed by previously approved mining activities. Those five nest sites have historically been used by red-tailed hawks, great horned owls, and golden eagles, but only hawks and owls have used the tree grove since 1998. The eagle pair expanded its territory to the south that year and has not returned to the general analysis area.

Ongoing impacts on existing nests and nesting habitats from current facilities and mining techniques would be the same as those described above under "Affected Environment," but would continue for up to two years beyond the current life-of-mine estimate; these existing impacts would be short-term and moderate. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Long-term monitoring data have demonstrated that the most consistent raptor pairs in the vicinity of the Buckskin Mine regularly nest within 0.25 mile and in view of regular human disturbance; thus, they are acclimated to having some level of activity occur near their nests. For example, one pair of red-tailed hawks has nested within 400 feet of an occupied residence and 600 feet from the McGee Road each year from 2002 through 2008, fledging young in all but one year. Great horned owls at Buckskin and other PRB mines regularly nest on active mine facilities such as coal crushers and batch load-outs. Details regarding raptor nesting efforts and success near mine operations are available in the Buckskin Mine annual wildlife reports, as well as those for other regional coal mines, on file with the WDEQ/LQD in Sheridan, Wyoming.

Despite their apparent acceptance of regular human disturbance near active nests, mining activity could cause raptors to abandon nests near disturbance, particularly if operations unintentionally encroach on active nests during a given breeding season. Mining activities could also remove intact nests during the non-breeding season. Although these actions could have an impact on individual birds or pairs, mining associated with the Proposed Action would not have an impact on regional raptor populations, because the level of use by nesting raptors is low in the area. Additionally, the Buckskin Mine has a USFWS-approved raptor mitigation plan in place for the existing permit area to minimize negative impacts on nesting raptors and provide mitigation, as needed. The raptor mitigation plan would be revised during the permitting phase to accommodate the proposed tract. Continued use of those mitigation measures would further reduce risks to nesting raptors. The current plan and the USFWS approval letter are included in the existing Buckskin Mine permit document, on file with the WDEQ/LQD in Sheridan, Wyoming.

Under the Proposed Action, surface mining would reduce the availability of native foraging habitats for both nesting and non-nesting raptors. Because native habitats in the vicinity of the general analysis area are dominated by upland grasslands, ground-nesting raptors and those foraging in the area should be able to transition easily to reclaimed grassland parcels. Equipment yards associated with mining provide additional habitat for prey species such as cottontails and

rodents. Raptor pairs have voluntarily and repeatedly nested near such areas at Buckskin and other coal mines in the PRB. Results from annual monitoring of prey populations at these mines have demonstrated that raptor nesting efforts and productivity at surface coal mines in northeast Wyoming have been influenced primarily by natural factors such as prey abundance, untimely inclement weather, and availability of nesting substrates. Due to the limited presence of trees and lack of tall cliffs, raptor species that nest in those features are not as abundant as those that either nest on the ground or are adaptable to nesting on mine facilities or other human-made structures (e.g., platform nests). During mining, new nesting habitat can be created in reclaimed areas through enhancement efforts like the installation of platform nests, relocation of snags, and tree plantings.

Bald eagle sightings in the vicinity of the general analysis area have averaged only 0.5 per winter over the last 25 years (1984 through 2008); no bald eagle nests have ever been documented at the Buckskin Mine. One or two individuals have infrequently been seen perched in the trees in the southeastern corner of the proposed tract during that period, but the tree stand has not officially been classified as a winter roost site. As described previously, those trees are within the existing Buckskin Mine permit area and are already subject to future disturbance and/or appropriate mitigation measures that might be necessary.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on raptor nest sites and habitat in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area, and would be associated with activities necessary to support mining on existing leases, as described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

One intact raptor nest and six former nest sites are located in the overlap between the general analysis area and the permit area (map 3.10-1, table 3.10-1). As described under the Proposed Action, red-tailed hawks, great horned owls, and golden eagles have historically nested in the tree grove that also alls within the proposed tract, but only hawks and owls have nested there since 1998. Short-eared owls have nested elsewhere in the overlap area, but those sites have already been disturbed by previously permitted mine operations within the general analysis area.

Because native habitats in the vicinity of the general analysis area are dominated by upland grassland species, ground-nesting raptors and those foraging in the area should be able to transition easily to reclaimed parcels. Impacts on raptors using the trees in the overlap area for perching or nesting would be the same as described under the Proposed Action.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration would have new impacts on two intact raptor nests (table 3.10-1, map 3.10-1); the

remaining intact nest falls within the tree grove discussed under the Proposed Action and No Action Alternative. No additional former nest sites would be added under Alternative 2. Ongoing impacts on existing nests, nesting habitat, and foraging habitat from current facilities and mining techniques would be the same as those described for the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate; these impacts would be short-term and moderate. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to premining conditions. These reclaimed areas would provide alternate nesting and/or foraging habitats for local raptors.

Only two other stands of trees are present in the general analysis area besides the one in the overlap area, described for the Proposed Action; both are located adjacent to currently or recently occupied residences. Red-tailed hawks were first documented nesting near an occupied residence located between the McGee and Collins roads in 2002; the pair fledged two young that year. Hawks nested in that shelterbelt in each of the subsequent six years, despite increased activity at the residence in recent years; young fledged in five of those six years. No raptor nests have been documented in the shelterbelt near the recently vacated residence west of the junction of these roads. The lone intact ferruginous hawk nest in the general analysis area has never been active in the years since it was discovered in 1999. No active nests for this species have ever been recorded near the Buckskin Mine during the last 25 years of annual monitoring, although the presence of ground nests that are characteristic of ferruginous hawks suggests historic nesting activity. These ground nests can persist for many years without use as a result of the dry climate.

Three additional intact raptor nests are located beyond, but within 0.5-mile of the general analysis area (map 3.10-1); that is the distance recognized by the BLM as an adequate buffer between disturbance and nests of most raptor species. All three structures have been classified as ferruginous hawk nests due to their physical locations and composition, but none have been active since their respective discoveries. One of those three nests is in the overlap area and will be impacted regardless under all alternatives. The remaining two structures are approximately 0.5 mile north of the general analysis area. These nests are separated from the general analysis area by multiple ridges and, thus, are buffered from future visual and audio disturbance in that area.

As described in chapter 2, Kiewit does not anticipate relocating either county road. Should those areas be leased and scheduled for disturbance, the Buckskin Mine would be required to revise its monitoring and mitigation plan to provide adequate protection from mine-related disturbances for nesting or roosting raptors.

3.10.6 Upland Game Birds

3.10.6.1 Affected Environment

Upland Game Birds

Four upland game bird species are known to occur in suitable habitats in the general analysis area: the mourning dove (*Zenaida macroura*), gray partridge (*Perdix perdix*), sharp-tailed grouse (*Tympanuchus phasianellus*), and greater sage-grouse (*Centrocercus urophasianus*), hereafter referred to as sage-grouse. Although all four species have been documented in and around the general analysis area over time, sightings typically consisted of fewer than 10 birds at a given location.

The mourning dove is the most common upland game bird species in the vicinity of the Buckskin Mine. Doves are especially abundant during spring and fall migrations, with fewer observations during the nesting season. This species is also a relatively common breeding bird in Campbell County and may be found in a variety of habitat types (Cerovksi et al. 2004). Doves are often seen near sites with water sources and trees, though they are occasionally observed in sagebrush and greasewood stands. Mourning doves were recorded in the general analysis area, including in the proposed tract, during surveys conducted in both 2007 and 2008, and in previous years. Individuals observed in the proposed tract were most often associated with the small stand of trees in the southeastern corner that overlaps the existing Buckskin permit area.

The gray partridge (a.k.a. Hungarian partridge or Hun) is an introduced, non-migratory game bird that forms flocks (or coveys) outside the breeding season. Gray partridge have observed along the reclaimed channel of Rawhide Creek inside the existing Buckskin permit area; that area is approximately 1.5 miles southeast of the general analysis area. However, this species is not encountered with any regularity, with intervals of several years passing between sightings. No gray partridge were observed in the general analysis area during 2007 or 2008.

The greater sage-grouse is a species of concern throughout the West and, as such, is given greater consideration in this EIS. Although the sharp-tailed grouse does not have the same status as sage-grouse, it has been documented at the Buckskin Mine over the years. Surveys for both species are conducted using the same timing and protocols. Consequently, portions of the following discussion apply to both species. Individual discussions are provided by species, where appropriate.

Grouse Terminology and Survey Methods

The WGFD manages and regulates grouse populations in Wyoming, while the WDEQ/LQD regulates surface coal mines in the state. Survey protocols for grouse used at Buckskin and other coal mines in northeast Wyoming are based on Appendix B of the WDEQ/LQD Coal Rules and Regulations. The wildlife survey and reporting protocols in this document are based on input and guidance provided by the WGFD. Those protocols are used during all baseline and annual monitoring efforts conducted at surface coal mines in the Wyoming PRB. For consistency with those efforts, WGFD nomenclature for leks and their management status is used in this EIS.

A lek is defined as a traditional courtship display area attended by male grouse (WGFD 2006). For sage-grouse, leks are typically located in sagebrush dominated habitats. Sharp-tailed grouse leks can be found in both grassland and sagebrush habitats. The WGFD designates display sites as leks based on observations of two or more male grouse engaged in courtship displays made on two separate occasions during the appropriate time of day (WGFD 2006). Sub-dominant males may display on temporary strutting areas during population peaks, but those areas usually fail to become established leks. Therefore, the WGFD requires sites where small numbers (less than five) of males are observed strutting to be confirmed as active for two years before adding the site to the lek database. A group of leks in close enough proximity for males to move among them from one day to the next is considered a lek complex. A specific distance criterion to define a complex does not yet exist (WGFD 2006).

The WGFD has adopted definitions for lek status to provide consistency in nomenclature when collecting and reporting sage-grouse data (WGFD 2006). The definitions describe the annual status and a long-term management status of sage-grouse leks; those definitions can also be applied to sharp-tailed grouse leks. The status is assessed annually based on the following definitions:

- Active—any lek that has been attended by male grouse during the strutting season.
- Inactive—any lek where sufficient data suggests that there was no strutting activity throughout a strutting season.
- Unknown—leks for which status as active or inactive has not been documented during the course of a strutting season.

The WGFD management status is based on a lek's annual status, and includes three categories:

- Occupied—a lek that has been active during at least one strutting season within the prior 10 years. Occupied leks are protected through prescribed management actions during surface-disturbing activities.
- Unoccupied (formerly "historical lek")—This category is further divided into two sub-groups: "destroyed" and "abandoned." Unoccupied leks are not protected during surface-disturbing activities.
    - Destroyed—A formerly active lek site and surrounding habitat (including sagebrush) that have been destroyed and are no longer suitable for grouse breeding.
    - Abandoned—A lek in otherwise suitable habitat that has been "inactive" during the most recent 10 consecutive strutting seasons.
- Undetermined—Any lek that has not been documented as active in the last 10 years, and for which survey information is insufficient to designate it unoccupied. Undetermined leks are protected through prescribed management actions during surface-disturbing activities until sufficient documentation is obtained to confirm the lek is unoccupied.

The Buckskin Mine has conducted surveys of known grouse leks and searches for new leks as part of its wildlife baseline inventories and annual wildlife monitoring programs since the late

1970s and mid-1980s, respectively. Baseline inventories, which occurred prior to initial permitting and subsequent permit amendments, encompassed the mine's permit area and the area within a 2-mile-wide radius. Lek counts have been conducted in the Buckskin Mine permit area and the area within a 1-mile-wide radius as part of the annual monitoring program for the last 25 years (1984 through 2008). The annual monitoring area was expanded to accommodate each new amendment as it was approved. Due to the proximity of the proposed tract to the existing mine, the entire proposed tract and most of the general analysis area have been included in previous survey efforts since 1984.

Annual lek counts were voluntary until 1993, when the WDEQ/LQD issued the monitoring guidelines in Appendix B. Counts are conducted at seven- to ten-day intervals over a three- to four-week period from early April through early May each year per WGFD (2006) survey protocols. Surveys are conducted from the ground between 0.5 hour before sunrise and 1 hour after sunrise, and only during appropriate weather conditions (i.e., light wind and no precipitation). Each lek site is checked at least once in spring, with active leks counted at least three times. Repeated counts of males and females are made at each site until a consistent peak count is recorded.

Specific surveys for nesting and wintering grouse are not part of the Appendix B annual monitoring requirements for surface coal mines in the Wyoming PRB. However, seasonal ground surveys for other wildlife species have been conducted in potential grouse nesting habitats annually since 1984, including numerous walking surveys in sagebrush and other habitats targeting other ground-nesting species each spring. Surveys for winter grouse use have been conducted as part of the required baseline inventories for previous and proposed permit amendments over the years. Biologists conducted the surveys by driving and walking through sagebrush habitats watching for grouse and their sign (snow tracks, droppings, feathers) during winter months. Sage-grouse were also recorded during other wildlife surveys described in this section.

Targeted surveys for sage-grouse broods were conducted as part of the required annual monitoring program twice each July from 1995 through 1999. Based on the lack of brood sightings at coal mines throughout the region, the WGFD recommended in 1999 that surveys for grouse broods be dropped from annual monitoring requirements under Appendix B. The Buckskin Mine voluntarily continued brood surveys through summer 2001 before amending its WDEQ/LQD mining permit to remove that survey requirement. Due to the increasing concern about the sage-grouse throughout its range, the mine voluntarily conducted grouse brood surveys annually from 2004 through 2008. All surveys were conducted by walking along approximately 4 miles of native and reclaimed drainages (2 miles each) within the existing Buckskin Mine permit area and recording any grouse or grouse sign observed. Similar surveys were conducted in drainages within proposed expansion areas over the years as part of baseline inventory requirements. Coincidentally, some survey routes included drainages within the general analysis area. Biologists also watched for and recorded any sage-grouse and broods seen incidental to other wildlife surveys during all monitoring years.

Sage-Grouse Life History

The sage-grouse is considered a "landscape species," which means that large expanses of unfragmented land are required to provide all the habitat components necessary for their annual life cycle. This species is a sagebrush-obligate, and requires sagebrush habitat year-round for food, cover, and shelter, and for every phase of its life cycle. Sage-grouse often exhibit seasonal movements to use discrete sagebrush habitats, though the distance traveled varies widely among populations. These movements are often in response to devotion to seasonal-use areas (i.e., breeding, nesting/brood rearing, summering, and wintering), with adjustments related to severity of winter weather, topography, and vegetative cover.

Sage-grouse breeding occurs on leks during late March and April. Leks are generally established in open areas surrounded by Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), which is used for escape cover and protection from predators. Generally, lek sites are used year after year and are considered the center of year-round activity for resident sage-grouse populations. On average, approximately two-thirds of sage-grouse hens nest within 3 miles of the lek where they were bred. New spring plant growth, residual cover, and understory are important habitat components for nesting sage-grouse hens.

Areas near nests are used for several weeks by hens for brood rearing. The habitats used during the first few weeks after hatching must provide both good cover to conceal the chicks and essential nutritional requirements during this period of rapid development. Brood-rearing habitats that have a healthy and wide diversity of plant species, particularly grasses and forbs, tend to provide the variety and abundance of insects that are an essential protein supply for the young birds.

Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields. As summer progresses and forbs mature and dry up, sage-grouse broods must move to more mesic or wet meadow-type habitats where succulent plants and insects are still available. This can be especially important in drier years and during extended periods of drought. As the fall season nears, sage-grouse form flocks as brood groups come together. As fall progresses, sage-grouse move toward their winter ranges.

During winter, sage-grouse feed almost exclusively on sagebrush leaves and buds. Suitable winter habitat requires sagebrush to be accessible, especially in areas where snowfall is common. It is crucial that sagebrush be exposed at least 10 to 12 inches above snow level, as this provides food and cover for wintering sage-grouse. Population and habitat analyses suggest that wintering habitat can be as limiting as breeding habitats.

Regional and Statewide Sage-Grouse Population Trends

Overall, the sage-grouse population has been steadily declining in Wyoming and across the rest of the West. A study prepared by the Western Association of Fish and Wildlife Agencies estimated that sage-grouse populations in western North America declined at an overall rate of 2% per year from 1965 to 2003 (Connelly et al. 2004). The decline rate was greater from 1965 to 1985, with populations stabilizing and some increasing from 1986 to 2003. For Wyoming,

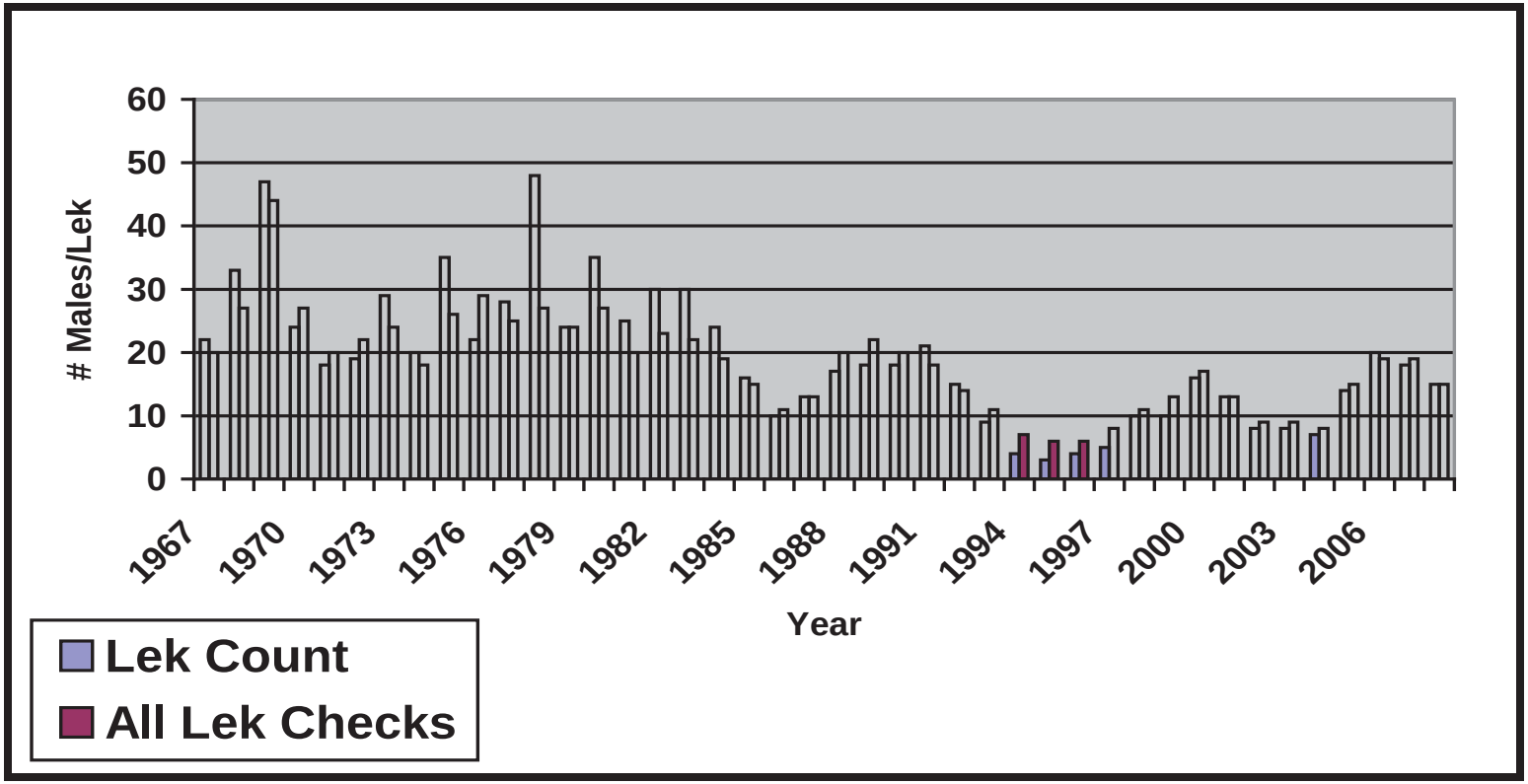
this study estimated that sage-grouse populations declined at an average rate of 0.51% per year from 1968 to 1986 (9.66% decline overall), and at an average rate of 0.33% per year from 1987 to 2003. Populations were lowest in the mid-1990s, with a gradual increase in numbers in some regions since that time (Connelly et al. 2004).

The general analysis area is within the Northeast Wyoming Local Sage-Grouse Working Group (NWLSWG) area, which includes portions of the WGFD Sheridan and Casper biological regions. Because the nearest USDA Forest Service lands are approximately 50 miles north and south of the general analysis area, this EIS does not include lek trends from the Thunder Basin National Grasslands. Results from that area are discussed in both the *South Gillette Coal Lease Application Final EIS* and the *Wright Area Coal Lease Application Draft EIS*, available on the Wyoming BLM website.

Sage-grouse monitoring has occurred in the NWLSWG area since 1967. Assuming the number of males per active lek accurately reflects sage-grouse populations, population trends have exhibited a cyclical pattern within this area. Periodic highs and lows in grouse numbers have occurred at approximately 10-year intervals (figure 3.10-1). With the exception of the most recent cycle, each successive peak was lower than the preceding peak; the same was true for successive low counts. This long-term trend suggests a steadily declining sage-grouse population (WGFD 2008b).

Comparisons between sage-grouse population trends in the NWLSWG area and statewide (figure 3.10-2) show strong similarities, though the average number of males per lek in the regional area has been lower than that observed statewide in most years. As in the NWLSWG area, the statewide sage-grouse population trend has exhibited a long-term (1960–2008) decline, a mid-term (1999–2008) increase, and a recent short-term (2006–2008) decline (WGFD 2008c). The mid- and short-term trends in statewide populations are believed to be largely weather related. Timely precipitation in some years resulted in improved habitat conditions, allowing greater numbers of sage-grouse to hatch and survive. Conversely, multi-year drought conditions are believed to have caused lower grouse survival in the early 2000s, leading to population declines.

The WGFD considers these trends as valid at the statewide scale, but more varied at the local scale (WGFD 2008c). For example, sub-populations in areas more heavily influenced by anthropogenic impacts (e.g., subdivisions, intensive energy development, large-scale conversion of habitat from sagebrush to grassland or agriculture, interstate highways) have experienced declining populations or extirpation despite recent population increases in other parts of the state (WGFD 2008c). The potential for West Nile virus, as well as loss of population connectivity, represent additional threats to this species in many parts of its range (Naugle et al. 2004).



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.10-1

Average Male Sage-grouse Lek Attendance within the Northeast Wyoming Local Working Group Area (1968–2006)

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.10-2

Average Number of Males per Lek Counted in Wyoming (1960–2008) with a Minimum of 100 Leks Checked Each Year

Agency Responses to Sage-Grouse Population Trends

Since 1999, the USFWS has received eight petitions requesting that the sage-grouse be listed under the ESA as threatened or endangered. Three of the petitions requested that sage-grouse be listed as endangered across its entire range. On January 12, 2005, following a 12-month status review on the species, the USFWS concluded that listing was not warranted at that time. On December 4, 2007, U.S. District Court, District of Idaho, ruled that the USFWS 12-month petition finding on sage-grouse was in error and remanded the case back to the agency for further reconsideration. On February 26, 2008, the USFWS announced the initiation of another status review for the greater sage-grouse; that review process has been extended and is expected to conclude in February 2010.

In response to these repeated petitions for listing under the ESA, the USFWS has indicated the need for continued efforts to conserve sage-grouse and sagebrush habitat on a long-term basis. That agency has encouraged continued development and implementation of conservation strategies throughout the species' range. In May 2002, the USFWS office in Cheyenne, Wyoming, released a list entitled "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming," which replaced the previous "Migratory Birds of High Federal Interest List." The sage-grouse is included as a Level I species on the updated list, which indicates the need for a monitoring and mitigation plan for this species. Although the sage-grouse continues to be managed by the WGFD, its inclusion on the revised list gives further impetus to ongoing annual survey efforts. The sage-grouse is also a BLM sensitive species (see appendix J) due to its recurring presence in the federal listing process.

On September 11, 2003, the Wyoming Game and Fish Commission announced that the 2003 hunting season for sage-grouse in Johnson, Sheridan, and Campbell counties would be closed. The closure followed the deaths of 11 sage-grouse in northeastern Wyoming from West Nile virus in August and early September of that year. According to WGFD's September 11, 2003, press release, the commission took this action because the incidence of infection was much higher in northeastern Wyoming than in the rest of the state, and the area is on the fringe of sage-grouse range with marginal, fragmented habitat. Recent lek count data indicate that Wyoming's sage-grouse populations increased slightly from 2004 through 2007. Lower incidences of West Nile Virus mortalities were also documented in those years, primarily due to cooler temperatures that reduced mosquito populations. Sage-grouse hunting seasons were reopened in 2004 (Christiansen 2004).

In 2007, Wyoming Governor Dave Freudenthal commissioned a Statewide Sage-grouse Implementation Team, which emerged from the Governor's 2007 Sage-Grouse Summit. On March 17, 2008, the implementation team preliminarily identified and mapped recommended sage-grouse core breeding areas in Wyoming in an effort to better understand the types of habitat grouse prefer and what areas should be protected. No such habitat was defined in the vicinity of the general analysis area.

On August 1, 2008, the Governor of Wyoming released an executive order regarding sage-grouse core area protection (Office of the Governor of Wyoming 2008) on state trust lands.

The sage-grouse core area protection concept came about because of work by the Sage-Grouse Implementation Team. The implementation team developed a core population strategy for the state "to maintain habitats and viable populations of sage-grouse in areas where they are most abundant." As part of that effort, the team delineated approximately 40 areas of state trust lands around Wyoming with a goal of maintenance and enhancement of grouse habitats and populations within the core areas. The areas were delineated by evaluating habitats within a 4-mile radius of selected sage-grouse leks in high lek-density areas.

The BLM Wyoming State Office is in the process of developing a statewide sage-grouse management policy and has incorporated sage-grouse focus areas based on the core area concept in the draft management policy. The BLM has indicated that the sage-grouse management strategy for future surface disturbance, which would include the Proposed Action and alternatives, will likely be based on the sage-grouse focus areas (BLM 2008d).

Grouse History at the Buckskin Mine

Based on results from annual counts and lek searches conducted for the Buckskin Mine, grouse occur but are not abundant in the general analysis area. In general, sharp-tailed grouse do not appear to be as prevalent as sage-grouse near the surface coal mines in northeast Wyoming. However, sharp-tailed grouse have been seen in greater numbers and with more frequency than sage-grouse in the general analysis area in recent years, though counts for both species have declined over time (table 3.10-2).

Table 3.10-2. Peak Grouse Attendance at Leks in the Vicinity of Buckskin Mine (1984–2008)

	Daly SAGR		Hay Creek SAGR*[1]		McGee SAGR[2]		Stickel STGR*		McGee I STGR		McGee II STGR*		McGee III STGR**	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1984	20	1	2	U	—	—	—	—	—	—	—	—	—	—
1985	20	4	8	U	—	—	—	—	—	—	—	—	—	—
1986	12	0	12	U	—	—	—	—	—	—	—	—	—	—
1987	10	0	23	U	—	—	—	—	—	—	—	—	—	—
1988	17	0	27	U	—	—	—	—	—	—	—	—	—	—
1989	16	5	15	1	—	—	—	—	—	—	—	—	—	—
1990	9	1	12	1	—	—	—	—	—	—	—	—	—	—
1991	10	1	17	0	—	—	—	—	—	—	—	—	—	—
1992	7	1	20	5	—	—	—	—	—	—	—	—	—	—
1993	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1994	0	0	U	U	—	—	—	—	—	—	—	—	—	—
1995	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1996	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1997	0	0	0	0	—	—	—	—	—	—	—	—	—	—

	Daly SAGR		Hay Creek SAGR*[1]		McGee SAGR[2]		Stickel STGR*		McGee I STGR		McGee II STGR*		McGee III STGR**	
Year	M	F	M	F	M	F	M	F	M	F	M	F	M	F
1998	0	0	0	0	—	—	—	—	—	—	—	—	—	—
1999	0	0	0	0	—	—	—	—	5	0	—	—	—	—
2000	0	0	0	0	—	—	13	1	8	0	—	—	—	—
2001	0	0	2	3	6	2	9	3	4	0	—	—	—	—
2002	0[3]	0	0	0	0	0	3	0	0	0	13	5	—	—
2003	0	0	0	0	1	3	0	0	0	0	8	1	—	—
2004	0	0	0	0	3	0	0	0	0	0	2	0	—	—
2005	0	0	0	0	0	0	0	0	0	0	0	0	4[4]	0
2006	0	0	0	0	U	U	0	0	0	0	0	0	0	0
2007	0	0	U	U	U	U	U	U	0	0	0	0	0	0
2008	0	0	0	0	0	0	U	U	0	0	0	0	0	0
Mgt. Status[5]	Abandoned		Occupied		Occupied		Occupied		Occupied		Occupied		Occupied	

M= Male; F = Female; SAGR = sage-grouse; STGR = sharp-tailed grouse; U = Unknown; --- = lek undiscovered

* In the Buckskin Mine permit area.

** In the general analysis area.

1 The lek was beyond the required annual monitoring area until 2002 but was checked at least once in most years.

2 The lek is beyond the required annual monitoring area; data presented is from the 2008 WGFD lek database.

3 Two displaying males were seen once approximately 1,000 feet south of the historic lek site. The birds were presumed to have flown in from another lek located 2.0 miles south of the Daly lek site.

4 Birds were not displaying; number of males and females unknown.

5 Management status based on WGFD (2006) classifications.

Four sharp-tailed grouse leks have been identified in the vicinity of the Buckskin Mine (table 3.10-2). All four are considered occupied under the WGFD management status classification system, though they have all been inactive for the last three years. No sharp-tailed grouse have ever been observed on the proposed tract, though flocks of as many as a dozen birds have infrequently been recorded in the winter feeding in fallow agricultural fields and perched in the tree shelterbelt near the junction of the Collins and McGee roads within the general analysis area. No sharp-tailed grouse have been seen in those locations since at least 2003. No nests or young of this species have ever been documented in the vicinity of the Buckskin Mine.

As indicated, no sharp-tailed grouse leks are present in the proposed tract. Two leks (McGee II and McGee III) are located in the general analysis area. The McGee II lek is in the overlap with the existing Buckskin Mine permit area, and the McGee III lek is immediately north of that boundary (map 3.10-1). The McGee I sharp-tailed grouse lek is approximately 0.25 mile north of the general analysis area, on the far side of a ridge and approximately 50 feet from the McGee Road. The Stickel lek is in the existing permit area, approximately 0.75 mile southeast of the general analysis area; that lek has been or will be impacted by previously permitted mine disturbance.

The greatest number of male sharp-tailed grouse recorded in the vicinity of the mine in a given year occurred in 2000, when 13 birds were seen at the Stickel lek and 8 were observed at the McGee I lek (table 3.10-2). However, sharp-tailed grouse counts declined steadily after 2000, and none were found during any lek monitoring or search efforts conducted after 2005. Given the proximity of the three McGee lek sites to one another, and the fact that grouse were never seen at two leks within that complex in the same year, it is likely that the birds were merely shifting their display sites periodically based on vegetative conditions or other unknown factors, while remaining in the same general area. Similar occurrences at sharp-tailed grouse leks have been observed elsewhere in the region. The Stickel lek may have been part of the McGee complex, as well.

Three sage-grouse lek sites have been documented at the Buckskin Mine over the last 25 years of annual monitoring (table 3.10-2); none of these sites is within the general analysis area (map 3.10-1). The Daly sage-grouse lek has been inactive for the last 16 consecutive years and is considered abandoned by the WGFD. The remaining two leks have also been inactive in recent years, but are still classified as occupied. The Hay Creek lek is within the existing Buckskin Mine permit area, approximately 0.5 mile southeast of the general analysis area. This site has been or will be affected by previously permitted disturbance in the permit area. The McGee sage-grouse lek is approximately 1.25 miles north of the general analysis area, and the abandoned Daly lek site is approximately 0.75 mile west of the permit area and on the far side of U.S. Highway 14-16.

The Daly sage-grouse lek has been monitored annually since 1984 (table 3.10-2). The greatest number of males recorded there was 20 in both 1984 and 1985. Peak male counts vacillated over the next seven years, but attendance gradually declined through 1992. No grouse were observed at the lek itself from 1993 through 2008. Two males were seen displaying approximately 1,000 feet south of the historic Daly lek site on one occasion in late April 2002, but no grouse were recorded in that area during subsequent surveys through 2008. Those two birds were presumed to have flushed from an active lek site approximately 2 miles south of the Daly lek.

The Hay Creek sage-grouse lek is located in the northeastern corner of the existing Buckskin Mine permit area. The lek was active every year from 1984 through 1992, with a peak count of 27 males in 1988. The site was not visited in 1993 or 1994, but no birds were observed during periodic checks from 1995 through 2000. Through 2000, the lek site was beyond the required annual monitoring area (existing permit boundary and 1-mile radius) for the Buckskin Mine; the mine surveyed the lek voluntarily during this period. Annual monitoring of the Hay Creek lek resumed from 2001 through 2008. Two displaying males and three hens were seen at the lek on one morning in 2001, but no grouse were present during subsequent checks that year, or in the following seven years.

The McGee sage-grouse lek is located beyond the required annual monitoring area for the Buckskin Mine and, therefore, is not included in that monitoring program. A WGFD biologist first recorded the lek in 2001. Biologists with that agency monitored the lek each year through 2005 and again in 2008. The peak male count during that period was the original six birds

discovered in 2001. No grouse were seen at the McGee sage-grouse lek during three of the six survey years, though the landowner reported birds present there in 2008 (the WGFD count was zero during three separate counts that year).

No grouse nests have been encountered in the general analysis area. No grouse broods for either species were recorded in the general analysis area during targeted surveys or incidental to surveys for other species. No sage-grouse have been observed during winter, though site visits occur less often at that time of year. No sharp-tailed grouse have ever been observed on the proposed tract during any season, though flocks of as many as a dozen birds have infrequently been recorded in the general analysis area, feeding in fallow agricultural fields and perched in the tree shelterbelt near the junction of the Collins and McGee county roads in winter. No sharp-tailed grouse have been seen in those locations since at least 2003.

As described in section 3.10.1.1, sagebrush habitat is limited to 302 noncontiguous acres in the general analysis area (including 46 noncontiguous acres in the proposed tract; these acreages represent less than 11% of the total vegetative cover for each area. Water sources in the general analysis area are limited to the diverted channel of the ephemeral drainage of Hay Creek, two small impoundments, and a playa. Of those, only one small impoundment is present in the proposed tract itself. All water bodies are seasonal, with water typically present in spring but dry by mid- to late summer.

3.10.6.2 Environmental Consequences

Given the dominant vegetation types in the general analysis area (upland grasslands and agricultural fields) and the lack of regular sightings over the last 25 years of monitoring, especially outside the breeding season, it is unlikely that either the sharp-tailed grouse or sage-grouse is a yearlong resident of the general analysis area.

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have short-term, minor to moderate impacts on upland game bird populations in the area; no grouse lek sites would be directly affected. Ongoing impacts on potential upland game bird habitats from current facilities and mining techniques would be the same as those described above under “Affected Environment,” but would continue for two years beyond the current life-of-mine estimate.

No grouse leks, nests, broods, or other signs of use (feathers, droppings, snow tracks) have been documented within the proposed tract during the last 25 years of monitoring. The proposed tract does not provide any unique habitat for these four upland game bird species. The mourning dove is the only species ever recorded in the proposed tract. Mining the proposed tract would affect known habitat for mourning doves, and potential habitat for gray partridge, sharp-tailed grouse, and/or sage-grouse to varying degrees. For example, the prevalence of grasslands and limited presence of surface water in the proposed tract limits its value to sagebrush obligates such as the sage-grouse. The only group of trees (potential habitat for doves and roosting sharp-tailed grouse) in the proposed tract also overlaps the existing permit area and, thus, would be disturbed

by previously permitted activities. The upland grasslands that dominate the proposed tract are better suited for gray partridge, an introduced species, but no partridge have been documented in the proposed tract. Because the proposed tract is dominated (71%) by upland grasslands, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining conditions.

Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on upland game birds and habitat, including grouse lek sites, in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area, and would be associated with activities necessary to support mining on existing leases, as described in section 1.1.3.3. Those impacts would be short-term and moderate, with disturbance and reclamation occurring incrementally in the area. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

No sage-grouse leks are present in the general analysis area, but one site is approximately 0.5 mile southeast of that area, within the existing mine permit area (map 3.10-1).

Three occupied sharp-tailed grouse leks have been or would be affected by previously permitted mine activities under the No Action Alternative. One sharp-tailed grouse lek is located in the overlap between the general analysis area and the permit area (map 3.10-1) and another lek is immediately north of that common area. The third sharp-tailed grouse lek is elsewhere within the Buckskin Mine permit area, approximately 0.75 mile southeast of the general analysis area.

No grouse nests or broods for either species have been documented in the overlap between the general analysis area and permit boundary, nor have grouse been observed in that area during winter. Both lek sites outside the general analysis area but within the existing permit area have been or would be affected by previously permitted mine activities on existing leases.

The tree windbreak in the overlap between the general analysis area and existing permit area represents potential nesting and/or roosting habitat for mourning doves and sharp-tailed grouse. As described previously, these trees would be impacted by mine disturbance under any of the alternatives considered in this EIS. Little sagebrush is present in the general analysis area, including its overlap with the existing permit area. Therefore, the establishment of reclaimed grassland communities after mining has been completed would not result in a dramatic change in habitat types from the premining landscape.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration, would have short-term, minor to moderate impacts on upland game birds due to their limited documented presence in the area. Impacts on known and potential upland game bird habitats from current facilities and mining techniques would be the same as those described above under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

No sage-grouse leks occur within the general analysis area (map 3.10-1). The nearest sage-grouse lek (Hay Creek) is within the existing permit area approximately 0.5 mile to the southeast and, thus, is already subject to disturbance from previously permitted activities. The McGee sage-grouse lek is on private surface approximately 1.25 miles north of the general analysis area. That site is on the far side of multiple ridges that provide a visual and audio buffer, and it is not likely to be affected by mine operations. Sage-grouse were last observed at the Hay Creek lek in 2001 and the McGee lek in 2004; both are considered occupied by the WGFD.

Two occupied sharp-tailed grouse leks have been documented in the general analysis area over the last 25 years of annual monitoring (map 3.10-1). As described previously, the McGee II lek is in the overlap area with the current permit area and the McGee III lek is immediately north of the overlap area. Due to their locations, those leks have been or would be disturbed by previously permitted mining of existing leases. The McGee I sharp-tailed grouse lek is approximately 0.25 mile north of the general analysis area. It would not be in view of the general analysis area due to the ridgeline that separates the two sites, but it could be affected by noise from within the general analysis area. The Stickel lek is approximately 0.75 mile southeast of the general analysis area and within the existing permit area; this site has been or would be disturbed by previously permitted activities on existing leases. Sharp-tailed grouse were last recorded at the McGee II lek in 2004 and the McGee III lek in 2005. The McGee I lek was last active in 2001, and the Stickel lek in 2002.

Disturbance and reclamation activities would be temporary and occur incrementally throughout the area. If mining activities disturb a lek, grouse would have to use an alternate site or establish a new lek for breeding activities.

In addition to lek sites, areas of suitable habitat for nesting are needed to sustain sage-grouse populations. One recent study suggests that availability of winter habitat may also affect sage-grouse populations (Naugle et al. 2006). The general analysis area is dominated (71% of total cover) by upland grasslands and agricultural fields, which do not provide the necessary shrub communities for forage and cover. No grouse nests or broods have been documented in the general analysis area, nor have grouse been observed there during winter. Additionally, the general analysis area is not included in or within several miles of either a state sage-grouse core area or BLM sage-grouse focus area, though that does not preclude the need for grouse management when they are present.

The general analysis area does not provide any unique habitat for these four upland game bird species, and future mine operations would affect existing and potential habitat to varying degrees. As described previously, the prevalence of upland grasslands and the limited presence of surface water reduce the area's value to sagebrush obligates such as the sage-grouse. The only group of trees (potential habitat for doves and roosting sharp-tailed grouse) in the area that is not adjacent to an occupied or recently vacated residence also overlaps the existing permit area and, thus, would be impacted by previously permitted activities regardless of the leasing decision. The upland grasslands and agricultural fields that dominate the area are well suited for gray partridge, an introduced species to this country, but no partridge have been documented in the general analysis area.

Leasing, mining, and reclaiming a tract within the general analysis area would result in permanent, alterations in the topography and long-term changes in vegetative composition from premine conditions. Because the general analysis area is dominated (71%) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to those in the premining landscape. Restoration of sagebrush communities that are present could be difficult to accomplish through artificial plantings, and can take decades through natural regeneration. Until sagebrush returns to its premining density, a reduction in potential habitat for wildlife species associated with that habitat would occur in the general analysis area.

Some evidence has been documented that sage-grouse do repopulate areas after reclaimed shrublands have become established, but that process may take decades (Braun 1998). Estimates for the time it would take to restore shrubs, including sagebrush, to premine density levels range from 20 to 100 years, which may delay sage-grouse repopulation in the reclaimed areas. Once they do return to an area, sage-grouse populations do not appear to attain their previous levels.

3.10.7 Other Birds

3.10.7.1 Affected Environment

The USFWS uses a list entitled the *Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming* (table 3.10-3) for reviews related to existing and proposed surface coal mining (USFWS 2002). This list was taken directly from the Wyoming Bird Conservation Plan (Cerovski et al. 2001), and was current through 2008. The USFWS considers Level I species as in need of conservation action, which includes having a monitoring and mitigation plan for those birds. Continued monitoring is recommended, but not required, for Level II species.

Table 3.10-3. Forty Migratory Bird Species of Management Concern for Wyoming Coal Mines: Historical Occurrence and Status in or within 0.5 Mile of the Buckskin Mine Permit Area[1] (2006–2008)

Species[2]	Historical Occurrence in the Vicinity of the Buckskin Mine[3]	2006	2007	2008
LEVEL I				
Mountain plover* *Charadrius montanus*	never recorded	—	—	—
Greater sage-grouse* *Centrocercus urophasianus*	occasional breeder	potential breeder	—	—
McCown's longspur* *Calcarius mccownii*	rarely observed	—	observed	—
Baird's sparrow *Ammodramus bairdii*	never recorded	—	—	—
Ferruginous hawk* *Buteo regalis*	historic breeder	—	—	observed
Brewer's sparrow* *Spizella breweri*	regular breeder (beyond general analysis area)	presumed breeder	presumed breeder	presumed breeder
Sage sparrow *Amphispiza belli*	never recorded	—	—	—
Swainson's hawk* *Buteo swainsoni*	rare breeder	—	potential breeder	—
Long-billed curlew *Numenius americanus*	infrequent spring migrant	—	—	—
Short-eared owl* *Asio flammeus*	infrequently observed	breeder	—	observed
Peregrine falcon *Falco peregrinus*	never recorded	—	—	—
Burrowing owl* *Athene cunicularia*	rare breeder	—	—	—
Bald eagle *Haliaeetus leucocephalus*	occasional in winter	limited winter resident	limited winter resident	limited winter resident
Upland sandpiper* *Bartramia longicauda*	infrequently observed	—	—	—
LEVEL II				
Cassin's kingbird *Tyrannus vociferans*	never recorded	—	—	—
Lark bunting* *Calamospiza melanocorys*	common breeder	presumed breeder	presumed breeder	presumed breeder
Dickcissel *Spiza americana*	never recorded	—	—	—
Chestnut-collared longspur* *Calcarius ornatus*	rarely recorded	—	—	—
Black-chinned hummingbird *Archilochus alexandri*	never recorded	—	—	—
Pygmy nuthatch *Sitta pygmaea*	never recorded	—	—	—

Species[2]	Historical Occurrence in the Vicinity of the Buckskin Mine[3]	2006	2007	2008
Marsh wren *Cistothorus palustris*	never recorded	—	—	—
Western bluebird *Sialia mexicana*	never recorded	—	—	—
Sage thrasher* *Oreoscoptes montanus*	rarely observed	—	observed once	—
Grasshopper sparrow* *Ammodramus savannarum*	occasional breeder	potential breeder	potential breeder	presumed breeder
Bobolink *Dolichonyx oryzivorus*	never recorded	—	—	—
Common loon *Gavia immer*	never recorded	—	—	—
Black-billed cuckoo *Coccyzus erythropthalmus*	never recorded	—	—	—
Red-headed woodpecker *Melanerpes erthrocephalus*	never recorded	—	—	—
Yellow-billed cuckoo *Coccyzus americanus*	never recorded	—	—	—
Eastern screech-owl *Megascops asio*	never recorded	—	—	—
Western screech-owl *Megascops kennicottii*	never recorded	—	—	—
Western scrub-jay *Aphelocoma coerulescens*	never recorded	—	—	—
Loggerhead shrike* *Lanius ludovicianus*	occasional breeder	potential breeder	potential breeder	—
Vesper sparrow* *Pooecetes gramineus*	common breeder	presumed breeder	presumed breeder	presumed breeder
Lark sparrow* *Chondestes grammacus*	occasional breeder	—	potential breeder	—
Ash-throated flycatcher *Myiarchus cinerascens*	never recorded	—	—	—
Bushtit *Psaltriparus minimus*	never recorded	—	—	—
Merlin* *Falco columbarius*	rarely observed	—	—	—
Sprague's pipit Anthus spragueii	never recorded	—	—	—
Barn owl *Tyto alba*	never recorded	—	—	—

[1] The survey area for the Buckskin Mine overlapped the entire proposed tract and much of the general analysis area in most years (from 1984-2008). Both areas were completely covered during baseline studies conducted from 2007 through 2008.

[2] Species are arranged in descending priority within each level as assigned in the Wyoming Bird Conservation Plan (Cerovski et al. 2001). Level I indicates a clear need for conservation action. Level II represents a need for continued monitoring.

[3] Historical occurrence in the Buckskin Mine survey area is based on records from baseline or monitoring studies conducted at the mine (1984-2008).

* Species noted with an asterisk regularly nest in the Powder River Basin.

The Buckskin Mine has conducted specific surveys for migratory birds of concern annually since at least 1993, incorporating new lists and survey protocols (breeding bird point counts) as they were issued. These surveys have been conducted in both spring and summer to detect both migrating and breeding birds. Beginning in 2006, annual point count surveys for breeding bird (primarily passerines) were conducted per a request by the USFWS Ecological Services Office in Cheyenne, Wyoming. Survey efforts used a fixed-radius circular plot method adapted from Reynolds et al. (1980). Although these surveys are not included in either Appendix B, results are included in the annual for the Buckskin Mine each year. These survey methods and areas are in accordance with the USFWS approved Avian Monitoring and Mitigation Plan for the Buckskin Mine.

As described in section 3.10.2, the annual monitoring survey area for most migratory bird species of concern includes the existing permit area and a 0.5-mile radius. Because they are protected under one or more federal laws, the survey area for bald eagles and other raptor species is expanded to a 1-mile radius. The annual monitoring survey area for sage-grouse is also a 1-mile radius, but leks within 3 miles of the general analysis area were considered for this EIS to meet BLM concerns about this species.

Due to the proximity of the general analysis area to the existing Buckskin Mine permit area, the entire tract has been included in annual surveys for avian species of concern since at least 1993, with significant coverage in the general analysis area during that period. Results from surveys conducted for migratory birds at the Buckskin Mine are available in baseline and annual wildlife reports, on file with the WDEQ/LQD in Sheridan, Wyoming. Those reports include a tabulation of the regional status, expected occurrence, historical observations, and breeding records for each species on the current list of avian species of concern for a given report year, as well as two or more preceding years; additional information for each species observed in a given year is also included in each report.

Table 3.10-3 provides a tabulation of the regional status and expected occurrence, historical observations, and breeding records for each of the species on the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming," based on a compilation of the results of the annual surveys conducted for the Buckskin Mine from 2006 through 2008. Eighteen of the 40 listed species have historically been observed in the migratory bird survey area, though they may not have been seen in the general analysis area: 10 Level I species and 8 Level II species. None of the Level I species regularly breed in the general analysis area, though they are often recorded elsewhere in the survey area. Twenty-two of the 40 avian species of concern have never been recorded in the general analysis area or Buckskin Mine permit area: 4 Level I and 18 Level II species. Some raptor species of management concern, including species that nest in the general analysis area, are discussed in section 3.10.5. Sage-grouse are discussed in section 3.10.6.

The most frequently recorded nesting species in the migratory bird survey area are the lark bunting (*Calamospiza melanocorys*), vesper sparrow (*Pooecetes gramineus*), and grasshopper sparrow (*Ammodramus savannarum*). All three of those species are considered Level II. The

Brewer's sparrow (*Spizella breweri*), a Level I species, often nests in sagebrush stands in unmined portions of the existing permit area, beyond the general analysis area. Five additional species have nested (including failed attempts) less often in the area, including the Swainson's hawk, sage-grouse, short-eared owl, loggerhead shrike (*Lanius ludovicianus*), and lark sparrow (*Chondestes grammacus*); the grouse and both raptor species are considered Level I. The bald eagle is only observed in the winter or as a migrant. The other eight species have been observed infrequently (table 3.10-3).

The mountain plover is included on the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming." The USFWS proposed listing the mountain plover as a threatened species in February 1999 but withdrew the proposal in September 2003 (USFWS 2008). The agency continues to encourage provisions that would provide protection for this species, as it continues to be protected under the Migratory Bird Treaty Act and as a sensitive species under BLM policy (Bureau Manual 6840.06 E. Sensitive Species). This species has not been documented in within the migratory bird survey area; nor was it documented during other wildlife surveys conducted for the Buckskin Mine.

Bald eagles are relatively common winter residents and migrants in northeastern Wyoming's PRB. No bald eagle winter roosts have ever been documented in the bald eagle survey area, though potential winter roosting habitat for this species is present. That habitat consists of isolated cottonwood shelterbelts in the general analysis area, as described in section 3.9. No known bald eagle nests, or consistent yearly concentrated prey or carrion sources (e.g., sheep, fisheries) for bald eagles have been documented in the bald eagle survey area.

The bald eagle was more common and abundant in the area during winters from 2004 through 2007 than in previous years. This may have been a result of mild winters and the abundance of lagomorphs (rabbits) to prey upon. Bald eagles also scavenged road-killed rabbits off of adjacent roads. Rabbit numbers appeared to be at or near a peak in their cycle during those years. During those winters, one or two bald eagles occasionally used the shelterbelt is in the overlap area between the general analysis area and existing Buckskin Mine permit area. Bald eagles had never been observed concentrating in this windbreak during the previous two decades of wildlife surveys. No bald eagles have ever been documented in the tree shelterbelt around the recently vacated residence near the junction of the Collins and McGee roads in the general analysis area, or the shelterbelt surrounding the occupied residence between the two roads. A single adult bald eagle was observed once perched in an isolated cottonwood just south of the latter residence. As noted, bald eagle sightings within the Buckskin Mine survey area averaged only 0.5 per year over the last 25 years (1984–2008).

The burrowing owl is uncommon at the Buckskin Mine and has never been observed in the general analysis area. This species is an infrequent breeder in the prairie dog colony just beyond the northeastern corner of the general analysis area.

The sage-grouse was recently added to the Level I list of avian species of concern at coal mines. This species is becoming less common in the vicinity of the Buckskin Mine, as described in section 3.10.6. No sage-grouse leks are present in the general analysis area, and sage-grouse

have not been recorded in either area during the last 25 years of annual monitoring. Both areas are dominated by upland grassland habitats, with only 11% (46 and 302 noncontiguous acres, respectively) of their areas comprised of sagebrush habitats. Suitable nesting habitat is scarce if not absent in the general analysis area for the remainder of the "Coal Mine List of 40 Migratory Bird Species of Management Concern in Wyoming;" therefore, the other species have rarely or never been recorded.

Under natural conditions, limited seasonal waterfowl and shorebird habitat is present in the general analysis area. Prior to CBNG development, the natural aquatic habitat in the general analysis area was mainly available during spring migration as a single ephemeral stream, two stock impoundments, and a closed-basin playa. All of these water features generally were quite low or dry after spring. The relatively recent development of CBNG resources upstream and within the general analysis area has enhanced surface water availability to some degree resulting in a limited increase in habitat for waterfowl and shorebird species. However, all water bodies within the general analysis area continue to be dry or nearly so by mid-summer in most years; exceptions occur during years with above average precipitation.

The adjacent Buckskin Mine has conducted a voluntary program of waterfowl and shorebird monitoring at various native and reclaimed water bodies in the existing permit area. Multiple surveys were conducted in spring and summer each year since 2004. Those surveys did not include the playa located between the Collins and McGee roads, the largest and most persistent water body in the general analysis area, but it did include a similar playa in the mine permit area, approximately 1.25 miles south of the general analysis area. Both playas have been enhanced by CBNG discharge water in recent years. Common species seen at the playa within the permit area include the Canada goose (*Branta Canadensis*), American wigeon (*Anas Americana*), blue-winged teal (*Anas discors*), mallard (*Anas platyrhynchos*), northern pintail (*Anas acuta*), northern shoveler (*Anas clypeata*), gadwall (*Anas strepera*), and green-winged teal (*Anas crecca*), along with common shorebirds such as the killdeer (*Charadrius vociferus*) and spotted sandpiper (*Actitis macularia*). Similar species have been or would be expected to be recorded at the playa in the general analysis area.

3.10.7.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have no new impacts on migratory bird species of management concern in Wyoming; impacts on waterfowl and shorebirds would be negligible. Ongoing impacts from current facilities and mining techniques would be the same as those described above under "Affected Environment," but would continue for two years beyond the current life-of-mine estimate; these impacts are short-term and minor to moderate, and occur incrementally through the area.

None of the 18 migratory bird species of management concern for Wyoming coal mines that have historically been observed in the migratory bird survey area are regularly seen in the

proposed tract. The upland grasslands that dominate the tract lack the specific characteristics (shrubs, wetlands, prairie dog colonies, or shorter, less dense grasses) typically associated with most Level I species that have historically been recorded in the area. No sage-grouse leks are present in the proposed tract. The bald eagle is the only avian species of concern that has been recorded in the proposed tract. This species has been documented fewer than 0.5 times per year in the vicinity of the Buckskin Mine, with even fewer observations in the tree grove in the overlap between the proposed tract and existing permit area. That shelterbelt is already subject to mine related disturbance from previously permitted activities on existing leases. Additional potential impacts on the sage-grouse and raptors in general, as well as measures in place to prevent impacts on these species from existing mining operations, were included in the preceding discussions.

The Proposed Action could have impacts on existing habitat for these species in the proposed tract and buffer. The habitat loss would be short-term for grassland species, but would last longer for shrub-dependent species. However, with less than 11% of the total composition, sagebrush is not a dominant species in those areas. Reclamation practices at Buckskin are designed to provide a mosaic of upland and bottomland habitats that would potentially host most of these species. All disturbance and reclamation efforts would occur incrementally throughout the area. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grasslands after mining has been completed would not result in a dramatic change in habitat types from the premining landscape. Periodic breeding bird surveys at other surface mines with similar habitats in the region since the mid-1980s have demonstrated that species richness and abundance in reclaimed habitats are equal to or greater than in their native counterparts, though species composition may not be the same due to differences between premining and postmining vegetation. Additionally, surface coal mines in the PRB of northeastern Wyoming are required to replace each tree lost to mining, though it will take many years for newly planted trees to reach maturity. Research projects on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Clayton et al. 2006; Shelley 1992).

No impacts on mountain plovers are anticipated because this species has never been documented in its survey area in the last 25 years of monitoring. Additionally, typical suitable habitat (short and sparse vegetation) for this species is not present in the general analysis area.

The Proposed Action would have a negligible effect on migrating and breeding waterfowl and shorebirds due to the limited presence and seasonal nature of open water and wetland habitats in the area. Sedimentation ponds created during mining would provide interim habitat for aquatic fauna. The current reclamation plan for the Buckskin Mine requires that the segment of the Hay Creek channel in the northern portion of the general analysis area affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. The diversion channel and other future diversions would not provide the same habitat as the natural channels, although natural stream flow and the presence of CBNG discharge water would not be affected. Mitigation for all impacts on jurisdictional wetlands would be required in accordance with

section 404 of the Clean Water Act (section 3.7). If new wetlands do not duplicate the exact function and/or landscape features of the premine wetlands, species associated with those habitats could be beneficially or adversely affected as a result, depending on their premine status.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on wildlife and wildlife habitat in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area, and would be associated with activities necessary to support mining on existing leases, as described in section 1.1.3.3. Few avian species of concern have been recorded in the overlap area itself, so impacts are expected to be negligible. No trees or unique habitat features occur in that area other than Hay Creek, which has already been diverted during previously permitted activities. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration would have no new impacts on migratory bird species of management concern in Wyoming; impacts on waterfowl and shorebirds would be negligible. Impacts would be the same as or similar to those described under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

None of the 18 migratory bird species of management concern for Wyoming coal mines that have historically been observed in the vicinity are regularly seen in the general analysis area. The upland grasslands and agricultural lands that dominate the area lack the specific characteristics (shrubs, wetlands, prairie dog colonies, or shorter, less dense grasses) typically associated with most Level I species that have historically been recorded in the area. No sage-grouse leks are present in the general analysis area; the lone sage-grouse lek in the immediate vicinity is located in the existing permit area and, thus, is already subject to previously permitted disturbances. Fewer than 0.5 bald eagle sightings per year have been recorded in the entire Buckskin survey area that overlaps the general analysis area. The tree grove where bald eagles have occasionally been observed is in the overlap with the existing permit area, which is already scheduled for eventual disturbance associated with previously permitted activities. Additional potential impacts on the sage-grouse, bald eagle, and raptors in general, as well as measures in place to prevent impacts on these species from existing mining operations, were included in the preceding discussions.

Impacts on existing habitats for these species would be short-term for grassland species, but would last longer for shrub-dependent species. However, with less than 11% of the total composition, sagebrush is not a dominant species in the general analysis area. Reclamation practices at Buckskin are designed to provide a mosaic of upland and bottomland habitats that would potentially host most of these species. All disturbance and reclamation activities would occur incrementally throughout the area. Because the proposed tract is dominated (71%) by

upland grassland and agricultural lands, the establishment of reclaimed grasslands after mining has been completed would not result in a dramatic change in habitat types from the premining landscape. Periodic breeding bird surveys at other surface mines with similar habitats in the region since the mid-1980s have demonstrated that species richness and abundance in reclaimed habitats are equal to or greater than in their native counterparts, though species composition may not be the same due to differences between premining and postmining vegetation. Additionally, surface coal mines in the PRB of northeastern Wyoming are required to replace each tree lost to mining, though it will take many years for newly planted trees to reach maturity. Research projects on habitat reclamation on mined lands within the PRB for small mammals and birds concluded that the diversity of song birds on reclaimed areas was less than on adjacent undisturbed areas, although their overall numbers were greater (Clayton et al. 2006; Shelley 1992).

No impacts on mountain plovers are anticipated because this species has never been documented in its survey area in the last 25 years of monitoring. Additionally, typical suitable habitat (short and sparse vegetation) for this species is not present in the general analysis area.

Alternative 2 would have a negligible effect on migrating and breeding waterfowl and shorebirds due to the limited presence and seasonal nature of this habitat in the area. Sedimentation ponds created during mining would provide interim habitat for aquatic fauna. The current reclamation plan for the Buckskin Mine requires that the segment of the Hay Creek channel in the northern portion of the general analysis area affected by currently permitted mining be reclaimed to restore its premining functions and aquatic habitats. The diversion channel and other future diversions would not provide the same habitat as the natural channels, although natural streamflow and the presence of CBNG discharge water would not be affected. Mitigation for all impacts on jurisdictional wetlands would be required in accordance with section 404 of the Clean Water Act (section 3.7). If the mitigated wetlands do not duplicate the exact function and/or landscape features of the premine wetlands, species associated with those habitats could be beneficially or adversely affected as a result, depending on their premine status.

Only three shelterbelts are present in the general analysis area. One stand is in the overlap with the existing Buckskin Mine permit area and the other two surround currently or recently occupied residences.

3.10.8 Amphibians, Reptiles, and Aquatic Species

3.10.8.1 Affected Environment

Wildlife surveys completed specifically for the Buckskin Mine and adjacent mines, as well as biological research projects in the eastern PRB, have documented numerous other wildlife species that inhabit the region, including various amphibians, reptiles, and aquatic species. Some of these species are common inhabitants of the wildlife survey area for the Buckskin Mine, but they have not necessarily been regularly observed in the general analysis area.

Reptile and amphibian species have been recorded during the various surveys at the Buckskin Mine and on adjacent lands, including the general analysis area. These species include the tiger salamander (*Ambystoma tigrinum*), great plains toad (*Bufo cognatus*), boreal chorus frog (*Pseudacris triseriata maculata*), eastern short-horned lizard (*Phrynosoma douglassi brevirostre*), prairie rattlesnake (*Crotalus viridis viridis*), and bullsnake (*Pituophis melanoleucas sayi*). The abundance of these reptiles and amphibians is difficult to determine but these species appear to be common to the area.

Under natural conditions, aquatic habitat is limited by the temporary nature of most surface waters in the general analysis area. The lack of deep-water habitat and extensive and persistent water sources within that region precludes the presence and diversity of fish and other aquatic species. Consequently, monitoring of aquatic species is not regularly conducted at the Buckskin Mine, and fish surveys were not required or conducted specifically for the proposed tract.

The scarcity of mesic habitats throughout the majority of the wildlife survey area for the Buckskin Mine also reduces the potential of the area to attract aquatic species. Recent influxes of CBNG discharge water into Hay Creek has provided extended periods of surface water in some, but not all, of the last few years.

3.10.8.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract (419 acres) and mining support activities (described in section 1.1.3.3.) in the buffer area to the north would have short-term, negligible to minor impacts on reptiles, with short-term, negligible impacts on amphibians and aquatic species. Ongoing impacts from current facilities and mining techniques would be the same as those described above under “Affected Environment,” but would continue for two years beyond the current life-of-mine estimate.

Mining the proposed tract would remove habitat for amphibians and reptiles in some areas. Disturbance and reclamation activities would occur incrementally throughout the area. Due to the limited presence of water in the area, no fisheries and few, if any, other aquatic species would be impacted. Because the proposed tract is dominated (71%) by upland grassland communities, the establishment of reclaimed grasslands after mining would not result in a dramatic change in habitat types from the premining landscape.

Under jurisdiction of the Buckskin Mine’s current WDEQ/LQD mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion does not impact the proposed tract. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Impacts on reptiles, amphibians, and

aquatic species within the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area, and would be associated with activities necessary to support mining on existing leases, as described in section 1.1.3.3; those impacts would be negligible to minor, depending on the species. Disturbance and reclamation activities would occur incrementally throughout the area. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Water resources in the overlap area are not sufficient to support fisheries and few, if any, other aquatic species would be impacted. Under jurisdiction of the Buckskin Mine's current WDEQ/LQD mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion affects the northern part of the overlap between the general analysis area and existing permit area. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area (up to 1,883 acres) and mining support activities (described in section 1.1.3.3.) in a 0.25-mile-wide buffer around the final tract configuration would have short-term negligible to minor impacts on reptiles, and short-term negligible impacts on amphibians and aquatic resources. Impacts would be the same as or similar to those described under the Proposed Action, but would continue for up to six years beyond the current life-of-mine estimate.

Mining in the general analysis area would remove habitat for amphibians and reptiles in some areas. Disturbance and reclamation activities would occur incrementally throughout the area. Due to the limited presence of water in the area, no fisheries and few, if any, other aquatic species would be impacted. Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to those in the premining landscape.

Under jurisdiction of the Buckskin Mine's current WDEQ/LQD mine permit, Hay Creek has already been diverted to recover coal from the existing coal leases (section 3.5.2.1). This diversion does not impact the proposed tract, but it does span the northern part of the general analysis area. The aquatic resources of Hay Creek would be restored after mining to approximate premining conditions.

3.10.9 Threatened, Endangered, Proposed, and Candidate Animal Species, and BLM Sensitive Species

Appendix I of this document contains the biological assessment, and appendix J contains a discussion of the sensitive species evaluation.

3.10.10 Regulatory Compliance, Mitigation and Monitoring

Regulatory guidelines and requirements designed to prevent or reduce surface coal mining impacts on wildlife include:

- fencing designed to permit passage of pronghorn and other big game species to the extent possible;
- development of a monitoring and mitigation plan for raptors and other migratory bird species of management concern that must be approved by the USFWS, including the following provisions:
  - creating raptor nests and nesting habitat through enhancement efforts (nest platforms, tree plantings) to mitigate other nest sites impacted by mining operations;
  - relocating raptor nests that would be impacted by mining in accordance with the approved raptor monitoring and mitigation plan;
  - obtaining a permit for removal and mitigation of golden eagle nests and those of other raptor species;
  - restricting mine-related disturbances from encroaching within stipulated buffers of active raptor nests from egg-laying until fledging to prevent nest abandonment and injury to eggs or young;
  - reestablishing ground cover necessary for the return of a suitable raptor prey base after mining;
  - requiring use of raptor-safe construction for overhead power lines;
- development of a Migratory Bird Species of Management Concern for Coal Mines in Wyoming Monitoring and Mitigation Plan, which must be approved by USFWS;
- restoring sage-grouse habitat after mining including reestablishing sagebrush and other shrubs on reclaimed lands and grading reclaimed lands to create swales and depressions suitable for sagebrush obligates and their young;
- restoring diverse landforms, replacing topsoil, and constructing brush piles, snags, and rock piles to enhance habitat for wildlife;
- restoring short-grass habitat for species that nest and forage in those habitat types;
- restoring habitat provided by jurisdictional wetlands; and
- reclaiming the stream channels and restoring surface water flow quantity and quality after mining to approximate premining conditions.

The current permit for the Buckskin Mine requires reconstruction of bed form features in major stream channels, such as pools and runs, that should help restore the channels' natural function, as well as provide habitat. Restoration will be or may be achieved by salvaging sufficient material from channel terrace alluvium or material having the same physical characteristics to reconstruct pool features. Current reclamation, as well as future reclamation of Hay Creek would incorporate any alluvium salvaged from the original channel. These measures are

included in the existing mining and reclamation permit and would be included in the amended mining and reclamation plans, if either of the action alternatives is implemented.

Baseline wildlife surveys were conducted for the adjacent Buckskin Mine before mining operations began. Annual wildlife monitoring surveys have been conducted since the mid-1980s. These surveys are required by state and federal regulations, and will continue for the life of the mine; the annual survey area would be expanded to accommodate new coal leases, as needed. The mine has also voluntarily conducted annual and/or periodic surveys for additional species that are not included in the monitoring required by state or federal regulations. The wildlife monitoring surveys cover the areas included in the mine permit areas and a surrounding perimeter that varies in size according to the species being surveyed. As a result, the entire proposed tract and most of the surrounding general analysis area have been surveyed as part of the required monitoring surveys for the Buckskin Mine for many years.

The annual monitoring programs include:

- spring surveys for new and/or occupied raptor nests, upland game bird lek locations, threatened and endangered species, and migratory birds;
- late spring surveys of raptor production for occupied nests, opportunistic observations of all wildlife species, threatened and endangered species, and migratory birds;
- raptor territorial occupancy and nest productivity surveyed annually in and within a 1- or 2-mile radius of the existing permit areas;
- summer surveys for raptors, migratory birds, and lagomorph density;
- winter surveys for bald eagle winter roosts in and within 1 mile of the permit area (conducted as needed based on proximity of disturbance to potential roosting habitat);
- voluntary winter surveys for big game in and surrounding the permit area (currently conducted during alternate years);
- voluntary aquatic surveys for fish and macro-invertebrates in the existing permit area (previous annual schedule, currently conducted during alternate years);
- voluntary annual surveys for migrating and nesting waterfowl, shorebirds, and other water obligate avian species; and
- breeding bird surveys (now required annually at all mines).

Monitoring data were collected by all of the surface coal mines in the PRB for big game species from at least 1995 until 1999, with most mines conducting annual surveys since the mid- to late 1980s until the early 2000s. In 1999, the WGFD reviewed monitoring data and requirements for big game species on those mine sites. They concluded that monitoring had demonstrated a lack of impacts on big game on existing mine sites. No severe mine-caused mortalities had occurred, and no long-lasting impacts on big game had been noted on existing mine sites. The WGFD recommended at that time that big game monitoring be discontinued on all existing mine sites. New mines will be required to conduct big game monitoring if located in crucial winter range or

in significant migration corridors, neither of which are present within the proposed tract or general analysis area. Although big game surveys are no longer required as part of the annual wildlife monitoring program at the Buckskin Mine, Kiewit has voluntarily continued these surveys on a reduced but regular schedule.

The Buckskin Mine currently operates under a raptor monitoring and mitigation plan approved by the USFWS. This plan would be amended to include the final tract configuration if additional coal reserves are leased and proposed for mining. The amended raptor mitigation plan would be subject to review and approval by USFWS before the amended mining plan is approved.

A monitoring and mitigation plan for migratory bird species of management concern has also been developed in cooperation with USFWS for the existing Buckskin mining operation, and that plan would be amended to include the final tract configuration. If additional species are documented nesting or using the area regularly, a mitigation plan would be developed to protect those birds and their habitat.

3.10.11 Residual Impacts

Although the lands disturbed by future mining would be reclaimed in accordance with the requirements of SMCRA and Wyoming statutes, some residual wildlife impacts would occur. The reduction in topographic variety would result in a permanent loss of habitat diversity and a potential decrease in slope-dependent shrub communities. This would reduce the carrying capacity of the land for shrub-dependent species. Limited riparian and aquatic habitats are present in the general analysis area. Areas that currently support sagebrush would be altered to a grassland community, perhaps for decades, during the interim between sage plantings and maturity in reclamation. Until premining habitats have been fully reestablished, such habitat transformations would likely result in a change in wildlife species composition. Those species may repopulate reclaimed areas, but populations may not attain premining levels. The limited presence of sagebrush communities in the general analysis area would help minimize such residual impacts. Minimal residual impacts on threatened and endangered, candidate, or proposed plant and animal species would occur, because few such species have ever been recorded in the general analysis area, and state and federal regulations require reclamation of specific habitats important for these species.

3.11 Land Use and Recreation

This section discusses the affected environment and environmental consequences in the general analysis area as they relate to surface and mineral ownership, land use (private and industrial), and recreation, including impacts resulting from the Proposed Action and alternatives.

3.11.1 Affected Environment

Campbell County does not have a countywide land use plan, but has been working on a comprehensive land use plan jointly with the City of Gillette. The City of Gillette's land use

plan, *City of Gillette/Campbell County Comprehensive Planning Program*, provides general goals and policies for land use in the county, including state and federal coal leases, and is an integral part of the overall plan for Campbell County (City of Gillette 1978). The proposed lease area does not have a designated zoning classification.

The entire surface of the existing Buckskin Mine permit area and general analysis area is privately owned by individuals or companies (map 3.11-1), while most of the subsurface minerals (all of the coal and the majority of oil and gas reserves) are federally owned (map 3.11-2). All oil and gas production facilities located in the proposed tract are privately owned; facilities in the rest of the general analysis area under a mix of federal and private ownership. Section 3.11.1.1 provides additional information about mineral ownership.

Wildlife habitat and livestock grazing are the primary present and historical land uses in the general analysis area. Secondary land uses include pastureland (ranching), dryland cropland, transportation, and CBNG development. Coal mining at the Buckskin Mine is and has been the dominant land use to the east and south of the general analysis area since the mid-1980s.

In addition to existing surface disturbance associated with the Buckskin Mine, the general analysis area includes small crop areas, two Campbell County roads (the Collins and McGee roads), several overhead electric transmission lines, oil and gas pipelines, and three residences. Only one of the three residences is currently occupied.

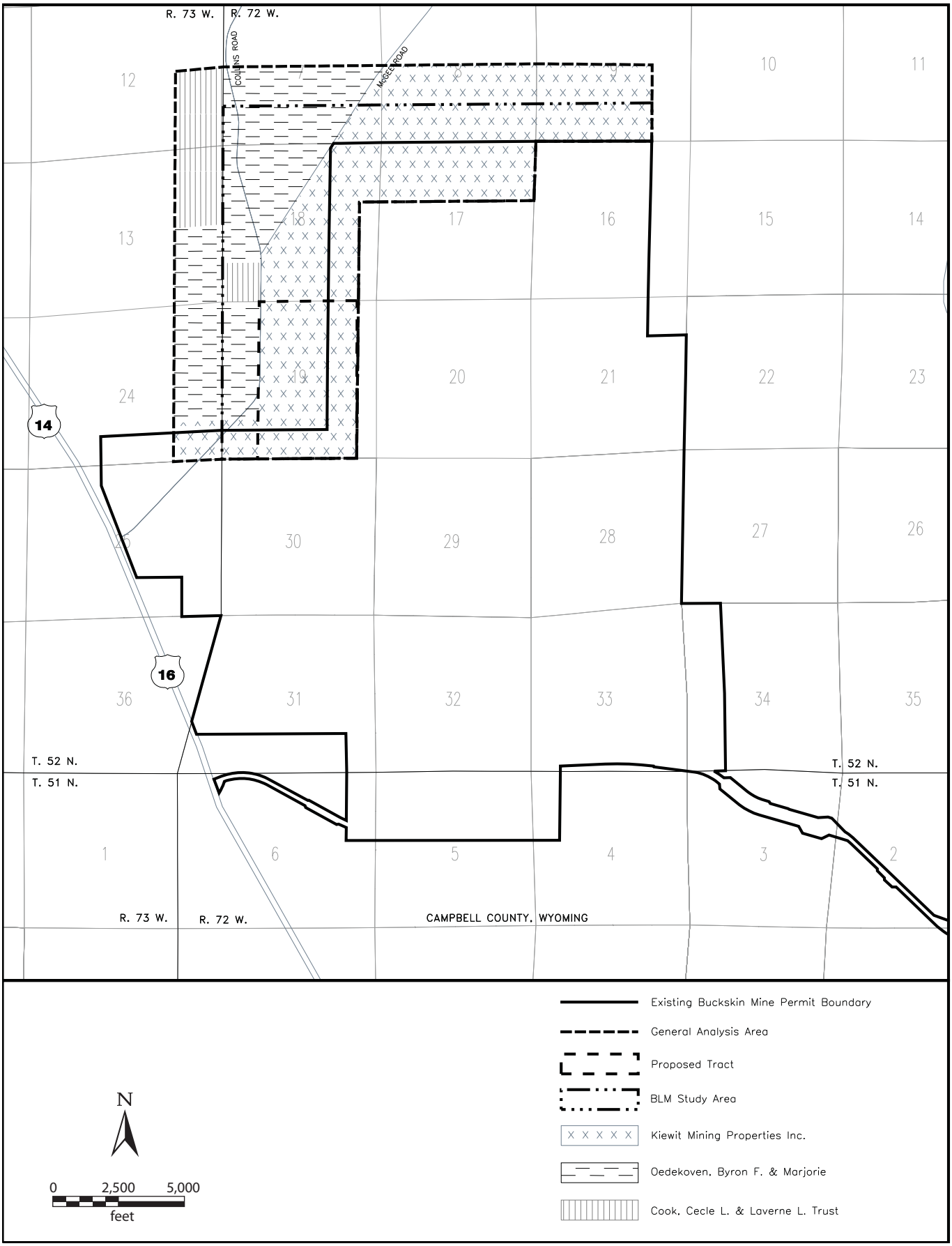
U.S. Highway 14-16 lies approximately 1 mile southwest of the general analysis area; it is accessed from the general analysis area via the Collins Road. The Collins Road forms the western boundary of the proposed tract, crossing vertically through the western part of the general analysis area. At its intersection with the McGee Road, it continues to the north while the McGee Road angles to the northeast. Wyoming Highway 59 is approximately 2 miles east of the general analysis area; no public access connects that highway with the general analysis area. Section 3.15 provides additional details about transportation facilities in the general analysis area.

3.11.1.1 Oil and Gas Production

Oil and gas estates in the general analysis area fall under a mix of federal and private ownership (map 3.11-2). Table 3.11-1 shows the breakdown of ownership in the proposed tract and BLM study area.

Table 3.11-1. Distribution of Oil and Gas Ownership in the Proposed Tract and BLM Study Area

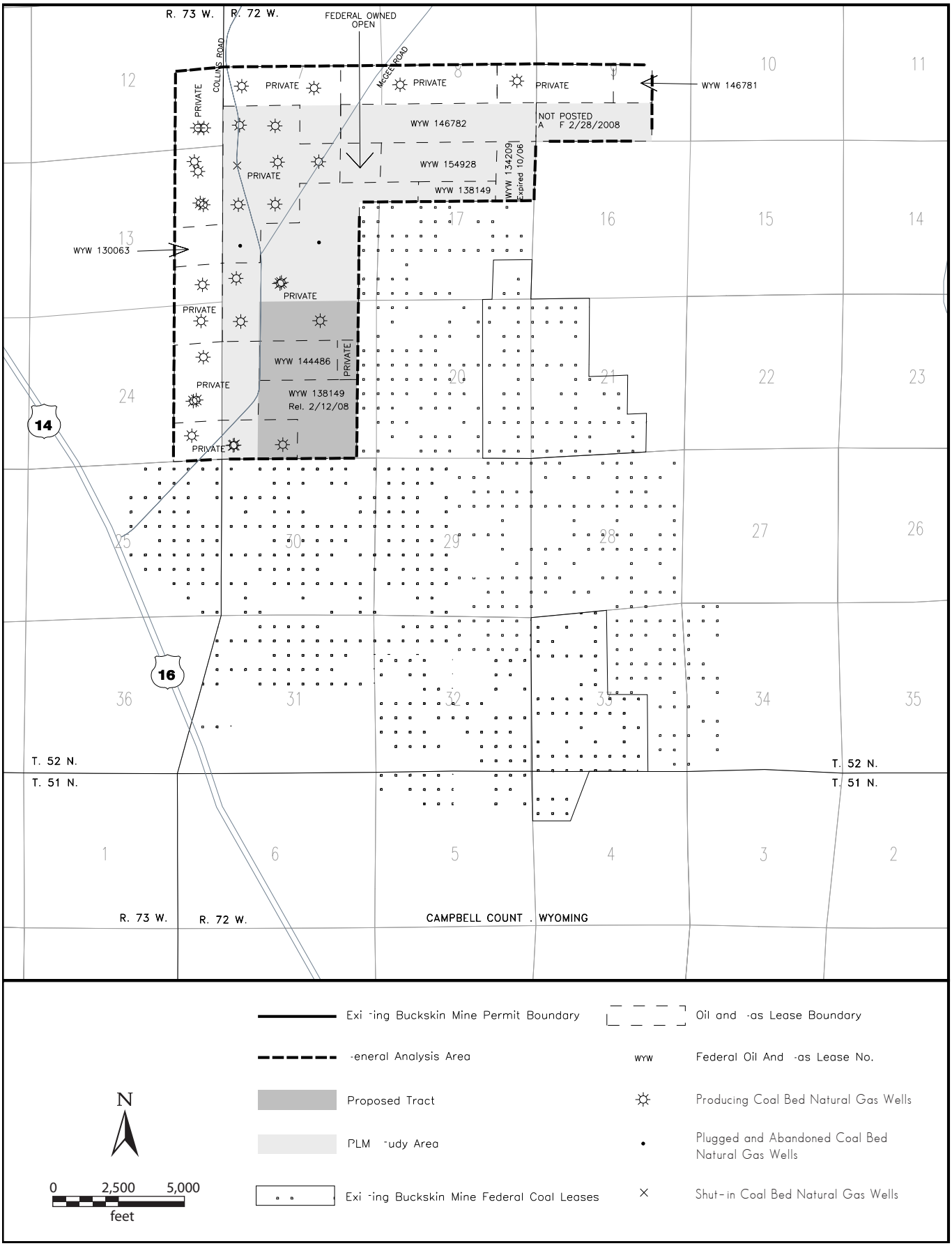
	Federal Ownership		Private Ownership	
Proposed tract	251.1 acres	60%	167.9 acres	40%
BLM study area	806.5 acres	43%	1,076.5 acres	57%



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.11-1

Surface Ownership in the General Analysis Area



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.11-2

Oil and Gas Ownership, Leases, and Facilities in the General Analysis Area

Table 3.11-2 lists the current (May 2008) federal oil and gas lessees in the general analysis area.

Table 3.11-2. Current Federal Oil and Gas Leases in the General Analysis Area

Lease Number	Location	Lessees of Record
T52N R72W		
WYW 134209	Section 17; Lots 1,9	Expired 10/31/06, closed 3/19/2007
WYW 138419	Section 17; Lots 6,7,10,11,14 Section 19; Lots 11,13–15, 19, 20 Section 20; Lots 3,6,10,11	Relinquished 2/6/2008, closed 2/12/2008
WYW 146781	Section 9; Lots 9,10 And other lands outside of BLM study area	Majestic Petroleum Operations LLC Preston Reynolds & Co., Inc. Redstone Resources Inc. Storm Cat Energy (Powder River) LLC Woodward Enterprises LLC
WYW 146782	Section 7; Lots 13,20 Section 8; Lots 10-16	Majestic Petroleum Operations LLC Preston Reynolds & Co., Inc. Redstone Resources Inc. Storm Cat Energy (Powder River) LLC Woodward Enterprises LLC
WYW 154928	Section 17; Lots 2–4	Van K. Bullock
WYW 144486	Section 19; Lot 10	Terminated 8/8/2008
T52N R73W		
WYW 130063	Section 2; Lots 7,10,12,18	Devon Energy Production Co. L.P. Majestic Petroleum Operations LLC Redstone Resources Inc. Woodward Enterprises LLC

According to Wyoming Oil and Gas Conservation Commission records (May 2008), no permitted, operating conventional oil wells are located in the general analysis area. The Supreme Court has ruled (98-830) that CBNG, previously referred to as coal bed methane or CBM, belongs to the owner of the oil and gas estate. As of May 2008, 30 permits had been issued for drilled or proposed well sites on lands in the BLM study area itself. Of those, 12 have expired without drilling, 3 are reported as plugged and abandoned, and 15 are currently producing. In the portion of the general analysis area outside of the BLM study area (in the 0.25-mile-wide buffer) another 12 wells are producing CBNG. Additional information relative to conventional oil and gas and CBNG development in the general analysis area is included in section 3.3.2.

When surface rights are in private ownership and the rights to develop the mineral resources (e.g., underlying oil and gas estates) are publicly held and managed by the federal government, it is referred to as a split estate. In split estates, mineral rights are considered dominant, taking precedence over other rights associated with the property, including surface ownership. The mineral owner must show due regard for the interests of the surface owner and occupy only those portions of the surface that are reasonably necessary to develop the mineral estate (BLM 2009a).

Under FLPMA, the BLM is mandated to manage public lands under a multiple-use approach, including the federal mineral estate, to enhance the quality of life for all present and future generations. The Mineral Leasing Act of 1920 guides the land use planning, leasing, bonding, operations, and reclamation associated with all development of federal oil and natural gas resources. Various laws granted land patents to private individuals but reserved the mineral rights for the federal government. The BLM must comply with the provisions of the laws under which the surface was patented; however, many of those laws do not identify the rights of the surface owner in split estate mineral development situations (BLM 2009a).

Numerous ancillary facilities exist in support of current oil, gas, and CBNG development in the general analysis area. This supporting infrastructure may include well access roads; well pads; surface or underground production equipment at the wellheads; well production casing that extends from the surface to the production zone; underground gas-gathering lines and high-pressure transmission pipelines; facilities for the treatment, discharge, disposal, containment, or injection of produced water; metering and compressor stations; and electrical overhead or underground power lines to energize pumps and compressors. Because CBNG development and production have been occurring near the Buckskin Mine for many years, some of these facilities, particularly pipelines, lie within the general analysis area (section 3.15).

Section 3.3.2 and section 3.11.1 address producing, abandoned, and shut-in oil and gas (conventional and CBNG) wells in the general analysis area; appendix E (table of permitted oil/gas wells) discusses these features within 3 miles of the general analysis area. Well location information, oil and gas ownership and oil and gas lease information are presented on map 3.11-2 and in table 3.11-2. The BLM manages federal lands on a multiple-use basis, in accordance with federal regulations. In response to conflicts between oil and gas and coal lease holders, BLM policy advocates optimizing the recovery of all minerals to ensure that the public receives a reasonable return for these publicly owned resources. Optimal recovery of coal and oil and gas resources requires negotiation and cooperation between the oil and gas lessees and the coal lessees. In the past, negotiations between some applicant mines and existing oil and gas lessees have resulted in agreements that allowed development of both resources on portions of recently issued LBA tracts. In the PRB, royalties have been and would be lost to both the state and federal governments if federally owned CBNG is not recovered prior to mining, or if federal coal is not recovered due to conflicts between lessees. State and federal governments can lose bonus money when the costs of the agreements between the lessees are factored into the fair market value determinations.

3.11.1.2 Coal Mining

South and east of the general analysis area, coal mining is the dominant land use. The mines in this area—Buckskin, Rawhide, Eagle Butte, Dry Fork, and Wyodak—form a contiguous development area from the northernmost mine (Buckskin) to the Wyodak mine located just outside and immediately east of the City of Gillette. This cluster of mines represents the northernmost group of developed coal mines in Campbell County. The permitted coal production rate at the Buckskin Mine is currently 42 million tons; actual production in 2007 was

25.3 million tons, representing an increase of approximately 11% over the 22.8 million tons produced in 2006. The other four coal mines are permitted for a combined total annual production of 86 million tons, and reported a total actual production in 2007 of 52.4 million tons. The Hay Creek II lease application is the only LBA currently pending in this group of mines. Eagle Butte's West LBA (WYW-155132) was the last lease granted to a mine in the group.

3.11.1.3 Recreation

Big game hunting (pronghorn, mule deer, and white-tailed deer) is the principal recreational land use within approximately 3 miles of the general analysis area (recreation analysis area) (section 3.10). Surface land ownership in the PRB is approximately 80% private, and hunting is allowed only with the landowner's permission. The WGFD reports that limited hunter access to private lands has become a primary issue in providing hunting opportunities and controlling optimal harvest levels and distribution (WGFD 2008a). During the past two or three decades, landowners have been increasingly reluctant to allow sportsmen to freely cross and hunt on their lands, thus reducing the amount of private lands that are open and reasonably available for hunting. Access fees are commonly levied and continue to rise. Most of the private land in the recreation analysis area is leased to professional outfitters catering to nonresident hunters.

In general, USDA-FS- or BLM-managed public lands in Wyoming, as well as state-owned school sections, are open to hunting if legal access is available. Due to safety concerns, however, publicly owned surface lands contained in active mining areas are closed to the public. No public lands are included in the recreation analysis area. In addition to access, WGFD (2008) cites that drought, severe winters, and increased incidents of poaching have diminished the hunting opportunities for deer and pronghorn in the recreation analysis area during the past decade.

The WGFD classifies most of the recreation analysis area as yearlong habitat for pronghorn. None of the area is classified as severe winter range, crucial, or critical habitat, and no migration corridors have been identified. The recreation analysis area is in pronghorn hunt area 17, which is within the Gillette pronghorn herd unit. During the 2007 season, harvest from this herd unit (including all animals harvested in hunt areas 17, 18, and 19) included 958 bucks, 533 does, and 0 fawns (a total of 1,481 pronghorn). Post-season population estimated for the same pronghorn herd unit in 2007 numbered 16,823, which is well above the objective (11,000) for the herd (WGFD 2008a).

The WGFD has classified the lands in the recreation analysis area as a mix of yearlong and winter/yearlong range for mule deer. No winter, crucial, or critical mule deer habitat or migration corridors have been identified in this area. The recreation analysis area is located in mule deer hunt area 18, part of the Powder River mule deer herd unit, which also includes hunt areas 17, 23, and 26. During the 2007 season, harvest from this herd unit (in hunt area 18) included 657 bucks, 255 does, and 0 fawns (a total of 912 mule deer out of 1,553 active licenses issued). Total harvest for the Powder River mule deer herd unit included 2,590 bucks, 1,076 does, and 44 fawns (a total of 3,710). The 2007 post-season population estimate was 49,560 with a herd management objective of 52,000. The WGFD believes that, because

outfitters lease much of the private land in this herd unit and hunting antlered bucks is encouraged, the buck/doe ratios are skewed, and additional pressure is placed on any accessible public lands.

The WGFD manages white-tailed deer separately from mule deer. This species is rarely seen in the recreation analysis area because white-tailed deer prefer riparian areas and irrigated agricultural lands (WGFD 2008). The entire area is outside of any white-tailed hunting area authorized by WGFD; therefore, no licenses may be issued or filled.

Rare sightings of elk have been confirmed in recreation analysis area. No elk hunt areas have been assigned in Campbell County. The closest is the Fortification area herd approximately 18 miles southwest of the mine, and another in the Rochelle Hills near the Thunder Basin National Grasslands, approximately 70 miles southeast of the general analysis area.

Upland game birds (e.g., turkeys, grouse) inhabit some parts of the recreation analysis area. Hunting opportunities are limited because of lack of habitat and restricted access to private lands. The turkey hunting seasons are spring and fall, while other upland game birds are hunted only in fall.

No sport fisheries exist in the recreation analysis area.

3.11.2 Environmental Consequences

3.11.2.1 Proposed Action

Under the Proposed Action, all existing oil and gas surface and downhole production and transportation equipment and facilities in the proposed tract would be removed, and all oil and gas development in the tract would be stopped during mining and reclamation activities. Oil and gas development in the proposed tract could resume after reclamation is complete and the bond is released (approximately 10 years). Deeper conventional oil and gas could be reestablished, and coal seams deeper than those intended for mining would also be available for CBNG development in the postmine environment.

Existing coal and transportation activities, infrastructure, and facilities would continue to operate in the area. Coal production would be expected to remain at its current average rate of 25 million tons per year for up to two years beyond the current life-of-mine estimate. No major public roadways would be affected; Kiewit does not anticipate relocating the Collins Road to access new coal reserves.

Livestock and wildlife would be incrementally displaced during mining as the active pit moves through the coal reserves, but the proposed tract would provide suitable grazing habitat for both groups after reclamation. Section 3.10 provides a detailed description of impacts on livestock and wildlife.

General access to and across the proposed tract for recreation, ranching, and oil and gas development would be restricted or eliminated during mining and reclamation. Following

reclamation bond release, management of the privately owned surface would revert to the private surface owner.

Mining support activities, described in section 1.1.3.3, would cause temporary surface disturbance in a buffer area north of the proposed tract. These activities would extend access limitations as well as impacts on all infrastructure and premining land uses to the buffer area.

3.11.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.11.2.3 Alternative 2

Under Alternative 2, impacts would be the same as those described under the Proposed Action, but would extend over an area of up to 1,883 acres. This alternative could impact public use of the Collins and McGee roads if one or both were closed or relocated, but Kiewit does not anticipate pursuing either option. Section 3.15 contains additional information regarding impacts on transportation.

Mining support activities, described in section 1.1.3.3, would cause temporary surface disturbance within a 0.25-mile-wide buffer around the final tract configuration. These activities would extend access limitations as well as impacts on all infrastructure and premining land uses to the buffer area.

3.11.3 Regulatory Compliance, Mitigation, and Monitoring

If one of the action alternatives is implemented, mined areas will be reclaimed as specified in the approved mine permit reclamation plan to support the primary postmining land uses of wildlife habitat and livestock grazing. Reclamation of agricultural pastures and croplands may occur, but is highly dependent on the postmine topography and landowner agreements. Mining and reclamation procedures would include stockpiling and replacing topsoil, using reclamation seed mixtures approved by the WDEQ/LQD, and replacing stock reservoirs to assure full use of all grazing and wildlife habitat restored under reclamation.

Steps to control invasive non-native plant species using chemical and mechanical methods would be included in the amended mine plan. Revegetation growth and diversity would be monitored until the final reclamation bond is released (a minimum of 10 years following seeding with the final seed mixture). Erosion would be monitored to determine if corrective action is needed during vegetation establishment. Controlled grazing would be used during revegetation to determine the suitability of the reclaimed land for anticipated postmining land uses.

See section 3.3.3.3 for discussion of regulatory requirements, mitigation, and monitoring related to oil and gas development.

The reclamation standards required by SMCRA and Wyoming state law meet the standards and guidelines for healthy rangelands for public lands administered by the BLM in Wyoming.

3.11.4 Residual Impacts

No residual impacts on land use and recreation are expected.

3.12 Cultural Resources and Native American Consultation

This section describes cultural resources, including Native American resources, in the general analysis area, and identifies impacts on these resources that could result from the Proposed Action and alternatives.

3.12.1 Cultural Resources

3.12.1.1 Affected Environment

Cultural resources represent the nonrenewable remains of past human activity. The PRB, including the general analysis area, has been inhabited by hunting and gathering populations for at least 13,000 years. Throughout prehistory, groups of mobile hunters and gatherers depended on the wide variety of plant and animal resources in the area for their survival.

Chronology

Frison's (1978, 1991) chronology for the Northwestern Plains divides the occupation of the area into the Paleoindian, Early Plains Archaic, Middle Plains Archaic, Late Plains Archaic, Late Prehistoric, Protohistoric, and Historic periods.

- Paleoindian period (13,000 to 7,000 years before present [B.P.])
- Early Plains Archaic period (7,000 to 5,000–4,500 years B.P.)
- Middle Plains Archaic period (5,000 to 4,500–3,000 years B.P.)
- Late Plains Archaic period (3,000 to 1,850 years B.P.)
- Late Prehistoric period (1,850 to 400 years B.P.)
- Protohistoric period (400 to 250 years B.P.)
- Historic period (250 to 120 years B.P.)

The Paleoindian period included a number of cultural complexes that were associated with distinctive styles of lanceolate or stemmed projectile points (Frison 1978). On the Northwestern Plains, the Paleoindian period is synonymous with the "big game hunting tradition," in which large mammals such as bison and mammoth were hunted. Evidence for the use of vegetal

resources is present among Paleoindian populations occupying the Black Hills and Big Horn Mountains.

Projectile point styles from the Early Plains Archaic period reflect a change from the large lanceolate and stemmed projectile points characteristic of the Paleoindian Period to large side- or corner-notched types. The subsistence pattern reflects use of a broad spectrum of resources and a much-diminished use of large mammals.

The onset of the Middle Plains Archaic is defined by the appearance of the McKean Techno Complex around 4,900 years B.P. (Frison 1978, 1991, 2001). McKean Complex projectile points include the Duncan and Hanna stemmed variants as well as the McKean lanceolate type. These point types continued to be used until 3,100 years B.P. when they were replaced by a variety of corner-notched points (Pelican Lake and Besant) (Martin 1999). Sites dating from this period exhibit a continued emphasis on plant procurement and processing.

The Late Plains Archaic is generally defined by the appearance of corner-notched dart points. These projectile points dominate most assemblages until the introduction of the bow and arrow around 1,500 years B.P. (Frison 1991). The period witnessed the continued expansion of groups into the interior basin grasslands as well as the foothills and mountains.

The Late Prehistoric period (1,850 to 400 years B.P.) is marked by a transition in projectile point technology around 1,500 years B.P. The corner-notched and side-notched dart points characteristic of the Late Archaic are replaced by smaller corner- and side-notched points for use with the bow and arrow. Ceramic technology also appears. Around 1,000 years B.P., the entire Northwestern Plains appears to have suffered an abrupt collapse or shift in population (Frison 1991). This population shift may reflect a narrower subsistence base focused on the communal hunting of pronghorn and bison.

The Protohistoric period (400 to 250 years B.P.) was the beginning of Euro American influence on the aboriginal cultures of the Northwestern Plains. Additions to the material culture include the horse and European trade goods such as glass beads, metal, and firearms. Projectile points of this period include side-notched, tri-notched, and un-notched points, with the addition of metal points. Groups occupying the basin at this time appear to have practiced a highly mobile settlement strategy.

The Historic period (250 to 120 years B.P.) is summarized from Schneider et al. (2000). The Oregon Trail brought numerous pioneers through Wyoming, but few stayed. It was not until the cattle industry developed in the late 1860s that what is now Wyoming became attractive for settlement. The region offered abundant grazing lands for raising livestock that could be shipped across the country via the recently completed (1867–1868) transcontinental railroad.

Settlement of the region surrounding Gillette, Wyoming, began in the late 1800s, after the Fort Laramie Treaty in 1876 placed the Sioux on reservations outside the territory. Cattlemen were the first settlers to establish themselves in the area, with dryland farmers entering the area after 1900. The town of Gillette was established by the railroad in 1891 to promote the settlement of undeveloped areas along the rail lines. The presence of the railroad allowed the cattle industry to

further develop because it facilitated shipping cattle from the area. Several early ranches established in the region include the 4J Ranch (1875), Half Circle L Ranch (1880s), I Bar U Ranch (1888), and the T7 Ranch (1881).

The dryland farming movement of the late 19th and early 20th centuries had a profound effect on the settlement of the PRB during the years around World War I. Although the principles of dryland farming were sound, success still required a certain amount of precipitation each year. Wyoming encouraged dryland settlement of its semi-arid lands through a Board of Immigration created in 1911. Newspapers extolled the virtues of dryland farming, and railroads conducted well-organized advertising campaigns on a nationwide basis to settle the regions through which they passed.

The most intensive period of homesteading activity in the eastern PRB occurred in the late 1910s and early 1920s. Promotional efforts by the state and the railroads, the prosperous war years for agriculture in 1917 and 1918, and the Stock Raising Act of 1916 with its increased acreage (but lack of mineral rights) all contributed to this boom period. A large number of land filings consisted of existing farms and ranches expanding their holdings in an optimistic economic climate. However, an equally large number of homesteaders had been misled by promotional advertising and were not adequately prepared for the experiences that awaited them in the PRB. It soon became apparent to the would-be dryland farmer that he could not make a living by raising only crops. Some were initially successful in growing wheat, oats, barley, and other small grains, along with hay, alfalfa, sweet clover, and other grasses for the increased number of cattle.

A drought in 1919 was followed by a severe winter, and market prices fell in the spring of 1920. Those homesteaders who were not ruined by the turn of events often became small livestock ranchers and limited their farming to growing forage crops for their livestock and family garden plots. Some were able to obtain cheap land as it was foreclosed or sold for taxes. During the 1920s, the size of homesteads in Wyoming nearly doubled and the number of homesteads decreased, indicating the shift to livestock raising (LeCompte and Anderson 1982).

With serious drought beginning in 1932, Weston, Campbell, and Converse counties were eligible for a drought relief program. The Northeast Wyoming Land Utilization Project began repurchasing the low value homestead lands and making the additional acres of government land available for lease. This helped the small operator expand his grazing land. Cropland taken out of production could be reclaimed and added to the grazing lease program. Grazing associations were formed to regulate grazing permits. In 1934, the Agricultural Adjustment Administration began studying portions of Converse, Campbell, Weston, Niobrara, and Crook counties. In all, 2 million acres were included in the Thunder Basin Project (LA-WY-1). Nationally, the program hoped to shift land use from farms to forest, parks, wildlife refuges, or grazing districts. In marginal agricultural areas, cash crops were replaced by forage crops, the kind and intensity of grazing was changed, and the size of operating units was expanded (USDA Forest Service n.d.).

During the development program to rehabilitate the range, impounding dams were erected, wells were repaired, springs developed, and homestead fences were obliterated while division fences

were constructed for the new community pastures. Farmsteads were destroyed and the range reseeded. Remaining homesteaders and ranchers often purchased or scavenged materials from the repurchased farmsteads. Pits were dug on some homesteads and machinery and demolished buildings buried (many of these were dug up during the World War II scrap drives). Ironically, the rehabilitation project used a labor pool of former farmers who had spent years building what the government paid them to destroy. Their efforts were so successful that almost no trace remains of many homesteads.

While counties lost much of their population base as a result of the Resettlement Administration relocation program, they were strengthened financially through school closings, limiting road maintenance to main arterioles, and receipt of delinquent taxes payments. The remaining subsidized ranches were significantly larger and provided a stabilizing effect on the local economies. Three grazing associations were formed: the Thunder Basin Grazing Association, the Spring Creek Association, and the Inyan Kara Grazing Association. These associations provided more responsible management of the common rangeland than in earlier years.

Early fur trappers noted the presence of coal in Wyoming in the mid 1800s and in northeastern Wyoming as early as the 1830s. The oldest coal mines in Wyoming were established along the Union Pacific Railroad; however, transportation systems were not developed in northeastern Wyoming until after the Fort Laramie Treaty in 1876. In the vicinity of Gillette, local ranchers and settlers unofficially mined coal in the area for their own use. Similar to the history described for the cattle industry and ranching, once the railroad arrived commercial development of coal mining began. Steam locomotives were the major consumer of coal in northeastern Wyoming, and coal production accelerated during World War II. Annual coal production declined after the war when the railroads transitioned from steam- to diesel-powered locomotives. In 1965, the demand for low-sulfur coal increased for use in power plants, and coal leasing began at an intensive level (Rosenberg 1990).

Class I and Class III Cultural Resources Surveys

A Class I files search is conducted through the Wyoming State Historic Preservation Office (SHPO) prior to beginning field surveys for new projects to determine if the area has been previously searched and to identify any known resources in the area. The files are accessible only to qualified archaeologists with appropriate clearance from the agency.

A Class III cultural resources survey is an intensive and comprehensive pedestrian inventory of a proposed project area conducted by professional archaeologists and consultants. The survey is designed to locate and identify all prehistoric and historic cultural properties 50 years and older that have exposed surface manifestations. These cultural properties are then evaluated for eligibility for inclusion in the National Register of Historic Places (NRHP). The properties must be recorded at a sufficient level to allow for this evaluation. Determinations of eligibility are made by the managing federal agency in consultation with the SHPO. If a property is determined to be not eligible for inclusion in the NRHP, no further work is required and the property can be disturbed without any further analysis or mitigation. Consultation with the SHPO must be completed before the mining plan can be approved.

Eighteen cultural resource surveys have been conducted in the vicinity of the general analysis area. Eleven of those surveys were associated with expansion of the Buckskin Mine and seven were conducted for other activities as follows: one pipeline project, one power line project, one seismic line project, two CBNG developments, and two conventional oil well developments. In November 2007, a Class III cultural resource survey was conducted in the portion of the general analysis area that had not been previously surveyed: Sections 7, 9, 18, and 19 of T52N R72W and Sections 12, 13, and 24 of T52N R73W. The 2007 survey was conducted over an area of approximately 920 acres (Newberry 2008).

A total of 19 cultural sites have been documented in the vicinity of the Buckskin Mine. Of these, 14 are located in the general analysis area (table 3.12-1). One isolated find was recorded and one previously recorded site, 48CA1832, could not be located during the 2007 survey.

Table 3.12-1. Cultural Sites Previously Identified in the General Analysis Area

Site Number	NRHP Status	Author(s)/Organization	Report/Study Name	Year	Site Type
48CA862	NE	University of Wyoming	Buckskin Mine	1980	P
48CA865	NE	University of Wyoming	Buckskin Mine	1980	P
48CA868	NE	University of Wyoming	Buckskin Mine	1980	P
48CA1828	NE	High Plains Consultants	Spring Draw Survey	1982	P
48CA1830	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA1832	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA1834	NE	High Plains Consultants	Spring Draw Survey	1982	H
48CA2223	NE	LTA Incorporated	Exxon Carbon Dioxide Pipeline Project Segment 2	1985	P
48CA3376	NE	TRC/Mariah Associates	Class III Inventory of the Hay Creek Tract Buckskin Mine	2000	H
48CA3898	NE	TRC/Mariah Associates	Triton Coal Company LLC Buckskin Mine Lease Expansion	2001	P
48CA6360	NE	Ecosystems Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6361	NE	Ecosystems Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6362	NE	Ecosystem Management	Buckskin Mining Company Hay Creek II	2006	H
48CA6797	NE	Antiquus Cultural Resource Consulting	Hay Creek II LBA	2007	H

NRHP = National Register of Historic Places; NE = Not eligible for the National Register of Historic Places

Site types: P = prehistoric; H = historic

Source: Newberry 2008

The entire general analysis area has been inventoried for cultural resources at a Class III level. Of the 14 sites identified in that area, 6 are prehistoric and 8 are historic (Newberry 2008). All of the prehistoric sites are determined not eligible for the NRHP. No further protection is afforded these sites and no further work is required. Historic site categories documented in the general analysis area fall under the context of rural settlement. Specifically, the historic sites in

the general analysis area are associated with homesteading and stock-raising circa the 1910s to the 1940s. All of the historic sites are determined not eligible for listing on the NRHP. No further protection is afforded these sites and no further work is required.

3.12.1.2 Environmental Consequences

Proposed Action

Under the Proposed Action, up to 6 prehistoric and 8 historic sites would be removed as a result of mining. All of these sites were determined to be not eligible for inclusion in the NHRP. Therefore, the Proposed Action would have no impacts on known cultural resources.

Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Currently approved surface disturbances associated with mining operations would continue in the overlap between the general analysis area and the existing Buckskin Mine permit area. Ongoing activities will have no impact on NRHP cultural resources. As discussed in section 2.2.2, a decision to reject the lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, up to 6 prehistoric and 8 historic sites would be removed as a result of mining. All of these sites were determined to be not eligible for inclusion in the NHRP. Therefore, Alternative 2 would have no impacts on known cultural resources.

3.12.1.3 Regulatory Compliance, Mitigation, and Monitoring

Class I and Class III surveys are conducted prior to disturbance to identify cultural resources on all lands affected by federal undertakings, including leasing of federal minerals. All cultural sites documented in the general analysis area during surveys associated with this EIS were determined to be not eligible for listing on the NRHP. Therefore, these sites are afforded no further protection and no further work is required before mining can begin.

Mining activities are monitored during topsoil stripping and other surface-disturbing activities. If previously unknown cultural resources are discovered during these operations, Buckskin will stop all activity in that vicinity until a qualified archaeologist can evaluate the find. If the archeologist determines it is warranted, SHPO is consulted to further evaluate the eligibility of the discovery for inclusion on the NRHP. Cultural resources that are determined to be eligible for the NRHP would be avoided or, if avoidance is not possible, a recovery plan would be implemented prior to disturbance and data would be collected (recorded or excavated) from the site(s) prior to removal. If a lease is issued under either of the action alternatives, the BLM would attach a stipulation requiring the lessee to notify appropriate state and federal personnel if cultural materials are uncovered during mining operations. This stipulation is included in appendix D. Full consultation with SHPO must be completed prior to approval of a mining plan.

3.12.1.4 Residual Impacts

No cultural resources eligible for listing on the NRHP have been formally identified and recorded in the general analysis area to date. If either of the action alternatives is implemented, sites determined to be ineligible for the NRHP would be permanently removed as a result mining. If cultural resources are discovered in the future that are determined to be eligible for the NRHP and cannot be avoided, they would be permanently removed as a result of mining.

Although cultural resources that are not removed or that remain undiscovered prior to disturbance would be permanently destroyed by surface coal mining operations, the analyses (e.g., intensive pedestrian inventories, site evaluations and excavation, and analysis of prehistoric cultural resources) required prior to implementation of these activities provide substantial information and a better understanding regarding existing resources and local prehistory in the region.

3.12.2 Native American Consultation

3.12.2.1 Affected Environment

Native American heritage sites can be classified as prehistoric or historic. Some may be presently in use as offering, fasting, or vision quest sites. Other sites of cultural interest and importance may include rock art, stone circles, various rock features, fortifications or battle sites, burials, and locations that are sacred or part of the oral history and heritage but possessing no human-made features.

No Native American heritage, special interest, or sacred sites have been formally identified and recorded in the general analysis area to date. However, the geographic position of the general analysis area between mountains considered sacred by various Native American cultures (the Big Horn Mountains to the west, the Black Hills to the east, and Devil's Tower to the north) creates the possibility that existing locations may have special religious or sacred significance to Native American groups.

3.12.2.2 Environmental Consequences

No Native American heritage, special interest, or sacred sites have been formally identified and recorded in the general analysis area to date. Therefore, the Proposed Action and alternatives would have no impact on known sites.

3.12.2.3 Regulatory Compliance, Mitigation, and Monitoring

The following tribes have been identified as groups with potential concerns about actions in the PRB: Crow, Northern Cheyenne, Shoshone, Arapaho, Oglala Sioux, Rosebud Sioux, Crow Creek Sioux, Lower Brule Sioux, Standing Rock Sioux, Cheyenne River Sioux, Apache Tribe of Oklahoma, Comanche Tribe of Oklahoma, and Kiowa Tribe of Oklahoma. Copies of the EIS have been sent to these tribal governments and representatives. They are also being provided with more specific information about the known cultural sites in the general analysis area. Their

help is being requested in identifying potentially significant Native American heritage, special interest, or sacred religious or cultural sites in the general analysis area before a leasing decision is made on the Hay Creek II application.

Native American tribes were consulted at a general level in 1995–1996 as part of an update to the BLM Buffalo Resource Area RMP. Some of the Sioux tribes were consulted by the BLM on coal leasing and mining activity in the PRB at briefings held in Rapid City, South Dakota, in March 2002.

If Native American heritage, special interest, or sacred sites are discovered in the future in the general analysis area, Buckskin will stop all activity in that vicinity until all appropriate entities have been notified and all steps have been taken to address concerns related to those sites.

3.12.2.4 Residual Impacts

Although cultural resources that are not removed or have remain undiscovered prior to disturbance would be permanently destroyed by surface coal mining operations, the analyses (e.g., intensive pedestrian inventories, site evaluations and excavation, and analysis of prehistoric cultural resources) required prior to implementation of these activities provide substantial information and a better understanding regarding existing resources and the local prehistory in the region.

3.13 Visual Resources

This section describes existing visual resources in the general analysis area and identifies impacts that would result from the Proposed Action and alternatives.

3.13.1 Affected Environment

Visual sensitivity levels are determined by the concern of viewers for what they see and the frequency of travel through an area.

Natural views within and into the general analysis area consist mainly of vegetated open landscapes, including rolling mixed-grass prairie, scattered stands of sagebrush, and a small region of rough breaks. Natural views from the general analysis area to the north and west are similar to those within the area. Views to the south and east consist mostly of surface mining activities and facilities. Signs of human use in and near the area include active farming and ranching activities (fences, homesteads, hayfields, croplands, farm equipment, and livestock), tree shelterbelts around residences, CBNG development (pipeline rights-of-way, well shelters, and compressor stations), transportation facilities (roads and railroads), and overhead electric power lines and substations. U.S. Highway 14-16 lies approximately 1 mile to the southwest of the general analysis area. The southern portion of the general analysis area can be viewed from this roadway with the Buckskin Mine storage silos beyond it. The Collins and McGee roads pass through the western half of the general analysis area, and active mining at Buckskin is visible from both roads.

For management purposes, the BLM evaluated the visual resources on lands under its jurisdiction in the 1985 Buffalo RMP (BLM 1985). The inventoried lands were classified into visual resource management (VRM) classes used to describe increasing levels of change within the characteristic landscape. They are defined as follows (BLM 2001a):

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

The 2001 RMP Update (BLM 2001a) covers Campbell County and the general analysis. The general analysis area is classified as VRM class IV because of the industrial nature of the energy development and active farming and residential use in the area. The overall natural scenic quality of class IV area is considered relatively low.

Surface coal mines are not considered to be major emitting facilities in accordance with the WDEQ/AQD Rules and Regulations (Chapter 6, Section 4). Therefore, State of Wyoming does not require mines to evaluate their impacts on class I areas, though the BLM does consider such issues during leasing.

3.13.2 Environmental Consequences

3.13.2.1 Proposed Action

Under the Proposed Action, mining operations in the proposed tract (419 acres) would be within 1 mile of and visible from U.S. Highway 14-16; mine support activities such as topsoil stripping and stockpiling (described in section 1.1.3.3) could be 0.25 mile closer to the highway. Mining activities would encroach to within 100 feet of the eastern right-of-way of the Collins Road (section 3.15). The road would remain in its existing alignment, but mined areas immediately east of the right-of-way would be lowered during and after mining operations. The areas disturbed under the Proposed Action would be considered VRM class V prior to reclamation. Reclamation would restore these areas to at least the premining VRM class IV conditions. The reclaimed land would resemble the surrounding undisturbed terrain, although slopes might appear smoother (less intricately dissected) and the vegetation would be more homogenous for several years. No visual resources that are unique to this area have been identified in or near the proposed tract.

3.13.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future. Mining operations would continue on existing Buckskin Mine leases and the current VRM class designations for the mine would not change.

3.13.2.3 Alternative 2

Under Alternative 2, mining in up to 1,883 additional acres of the BLM study area would be within 0.5 mile of and visible from U.S. Highway 14-16; mine support activities such as topsoil stripping and stockpiling (described in section 1.1.3.3) could be 0.25 mile closer to the highway. Mining activities would encroach to within 100 feet of the eastern rights-of-way for both the Collins and McGee roads (section 3.15). The roads would remain in their existing alignments, but adjacent mined areas would be lowered during and after mining operations. Mining could only occur between and west of these two roads if they were closed or relocated, as described in section 2.2.1.1 and section 2.2.3.1. Kiewit does not anticipate pursuing either of those options, and neither road is expected to be disturbed under this alternative. After mining and prior to reclamation, areas disturbed under Alternative 2 would be considered VRM class V; after reclamation they would be restored to at least their premining VRM class IV condition. The reclaimed area would resemble the surrounding undisturbed terrain. No visual resources that are unique to this area have been identified in or near the general analysis area.

3.13.3 Regulatory Compliance, Mitigation, and Monitoring

Landscape character would be restored during reclamation to resemble the original contours. Disturbed areas would be reseeded with an approved seed mixture that includes native species.

Section 3.2 and section 3.9 provide more detailed discussions of the regulatory requirements, mitigation, and monitoring for topography and vegetation, respectively.

3.13.4 Residual Impacts

No residual impacts on visual resources are expected.

3.14 Noise

This section describes existing conditions in the general analysis area associated with noise, and identifies impacts that would occur under the Proposed Action and alternatives.

3.14.1 Affected Environment

The affected environment is described for noise in the general analysis area and vicinity.

3.14.1.1 Noise Terminology

A decibel (dB) is the unit of measure used to represent sound pressure levels. The A-weighted decibel (dBA) is a measure designed to simulate human hearing by placing less emphasis on lower frequency noise, because the human ear does not perceive lower frequencies in the same manner as higher frequencies. Figure 3.14-1 presents noise levels associated with some commonly heard sounds. Short-term noise, lasting from several seconds to several hours, is quantified by the equivalent noise level (L_{eq}). The 24-hour average noise levels are quantified as "day-night" noise levels.

3.14.1.2 Noise-Sensitive Areas

For the purposes of this noise analysis, noise-sensitive areas have been categorized into the following groups. Map 3.4-4A and shows the occupied residences in and near the general analysis area discussed in this section; map 3.4-4B zooms in on the residence to the west and southwest of the general analysis area.

Occupied Residences within the General Analysis Area

One occupied residence is located within the general analysis area, less than 0.25 mile north of the existing mine permit area (map 3.4-4A). This residence is in direct line-of-sight of the current mine pit and associated support activities (e.g., topsoil stripping, soil stockpiling). The lack of obstacles between the residence and mine operations results in no buffering of noise generated at the mine.

Occupied Residences North of the General Analysis Area

These four residences range from 1.5 to 2.5 miles north of the general analysis area, and at least 2 miles north of the existing mine permit boundary (map 3.4-4A). The high rolling terrain between these residences and the general analysis area blocks their line-of-sight and creates a buffer from noise generated by current mine operations.

Occupied Residences along U.S. Highway 14-16 and West of the General Analysis Area

The nearest of these residences is approximately 0.5 mile west of the general analysis area (map 3.4-4B) and approximately 1.5 miles from overlap between the general analysis area and the Buckskin Mine permit area (map 3.4-4A). The small Green Valley Estates subdivision is immediately west of Highway 14-16, approximately 0.75 mile from the general analysis area and 1.75 miles from the majority of its overlap with the permit boundary. The high rolling terrain between these residences and the general analysis area provides a visual and audio buffer from current and future mine operations.

HOW IT FEELS	EQUIVALENT SOUNDS	DECIBELS	EQUIVALENT SOUNDS	HOW IT SOUNDS
Danger to hearing				
Near permanent damage level from short exposures	50 hp siren (100 ft)	130	Jackhammer	135 dB(A) Approx. 64 times as loud as 75dB(A)
	Jet engine (75 ft)		Chainsaw	
Pain to ears	Turbo-fan jet at takeoff power (100ft)	120	Fire cracker (15 ft.)	125 dB(A) Approx. 32 times as loud as 75dB(A)
Uncomfortably loud	Scraper-loader	110	Rock and roll band	115 dB(A) Approx. 16 times as loud as 75dB(A)
	Jet fly over (1000 ft)		Unmuffled motor bike (2-3 ft.)	
Discomfort threshold	Noisy newspaper press	100	Car horn	105 dB(A) Approx. 8 times as loud as 75dB(A)
Very loud	Air compressor (20 ft)	90	Unmuffled cycle (25 ft.)	95 dB(A) Approx. 4 times as loud as 75dB(A)
Conversation stops	Power lawnmower Steady flow of freeway trafic	80	Garbage trucks and city buses	85 dB(A) Approx. 2 times as loud as 75dB(A)
	10-HP outboard motor		Diesel truck (25 ft.)	
Intolerable for phone use	Automatic dishwasher	70	Garbage disposal	75dB(A)
	Vacuum cleaner		Food blender	
Extra auditory physiological effects	Window air conditioner outside at 2 ft.	60	Muffled jet ski (50 ft.)	
			Passenger car 65 mph (25 ft)	
			Busy downtown area	
Quiet	Window air conditioner in room	50	Normal conversation	55 dB(A) Approx. 1/4 as loud as 75dB(A)
Sleep interference	Occasional private auto at 100 ft.			
	Quiet home during evening	40		45 dB(A) Approx. 1/8 as loud as 75dB(A)
	Bird calls			
Very quiet	Library	30		35 dB(A) Approx. 1/16 as loud as 75dB(A)
	Soft whisper 5 ft.			
		20	In a quiet house at midnight	
	Leaves rustling	10		

No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Figure 3.14-1

Relationship Between A-Weighted Decibel Readings and Sounds of Daily Life

Occupied Residences along U.S Highway 14-16 and Southwest of the General Analysis Area

The nearest of these residences is within the existing permit area, approximately 0.25 mile west of the general analysis area (map 3.4-4B); this residence is immediately north of an existing coal lease (map 3.0-1). The Pineview Ranchettes and Bredthauer subdivisions lie mostly to the west of U.S. Highway 14-16, less than 0.25 mile from the Collins Road and the western limit of the existing Buckskin Mine permit area (map 3.4-4B). One house in the Pineview Ranchettes subdivision lies between the highway and the permit boundary, approximately 0.5 mile west of the general analysis area. The residence within the permit area is on the far side of a hill that separates it from all but the extreme southwestern corner of the general analysis area. Most of the residences in the two subdivisions are on a hillside above the rolling terrain to the northeast. Their line-of-sight to both the general analysis area and the existing permit area is generally unobstructed, so few potential buffers from mine-related noise are present. However, nearly all of the residences in this area are adjacent to and west of Highway 14-16, a well-traveled major highway and, thus, are currently exposed to regular traffic noise.

3.14.1.3 Existing Noise Sources and Existing Noise Levels

Existing noise sources in the general analysis area include coal mining activities, traffic on Highway 14-16 and the Collins and McGee roads, mine-related rail traffic along the rail spur serving the mines, wind, and CBNG activities and facilities.

Noise originating from CBNG development equipment (e.g., drilling rigs and construction vehicles) and production facilities (e.g., well sites and compressor stations) is apparent locally over the short term (i.e., 30 to 60 days) where well drilling and associated construction activities occur. The amount of noise overlap between well sites is variable and depends on the timing of drilling activities on adjacent sites and the distance between the site locations.

No baseline noise studies have been conducted for existing noise levels at the northern and western residences nearest the general analysis area, and no site-specific noise level data are available for the general analysis area. Studies of background noise levels at other PRB mines indicate that ambient sound levels generally are low, owing to the isolated nature of the area. Because the general analysis area is immediately adjacent to an operating mine, the current median noise level is estimated to be between 40 and 60 dBA for day-night, with the noise level increasing with proximity to active mining operations. Mining activities are characterized by noise levels of between 85and 95 dBA at 50 feet from actual mining operations and activities.

The residences in the general analysis area and the one in the permit area are both close to ongoing mine operations and county or federal road systems. Noise at these two residences is likely dominated by sources from the Buckskin Mine and public roads. The three subdivisions are close to other neighboring residences and Highway 14-16. Therefore, existing noise levels at those residences are likely dominated by traffic and ranching or suburban noise sources.

3.14.2 Environmental Consequences

The assessment of noise impacts from the Proposed Action and alternatives focuses on the following related noise issues:

- increased noise levels at residences with a direct line-of-sight to and within 0.25 to 0.5 mile of new mining activity;
- noise impacts on wildlife;
- increased railroad noise along the rail spur serving the mine; and
- hearing protection for mine workers.

The Noise Control Act of 1972 indicates that a 24-hour equivalent noise level of less than 70 dBA prevents hearing loss, and that a level below 55 dBA, in general does not constitute an adverse impact (EPA 1974).

3.14.2.1 Proposed Action

Increased Noise Levels at Occupied Residences

Within the General Analysis Area

Under the Proposed Action, mining and mine support activities (e.g., topsoil stripping, stockpiling) described in section 1.1.3.3 associated with the proposed tract would be approximately 0.75 mile farther from the occupied residence in the general analysis area than allowed under existing conditions. That occupied residence is currently experiencing mine- and traffic-related noise impacts from activities approximately 0.5 mile from the home; operations in the permit area could encroach to within 0.25 mile. Based on these factors, the Proposed Action would not increase noise levels at this residence; however, noise from mine-related activities would continue for two years beyond the current life-of-mine estimate.

North of the General Analysis Area

Under the Proposed Action, mining and mine support activities associated with the proposed tract would be approximately 0.75 mile farther from the occupied residences north of the general analysis area than allowed within the existing permit boundary. Mining activities would remain at least 2 miles from the nearest residence. High terrain between these residences and the proposed tract would provide a visual and audio barrier from mine operations. Based on these factors, the Proposed Action would not increase noise levels at these residences; however, noise from mine-related activities would continue for two years beyond the current life-of-mine estimate.

West of the General Analysis Area

Under the Proposed Action, the majority of mining and mine support activities associated with the proposed tract would be 0.5 to 0.75 mile closer to these residences than allowed within the existing permit boundary, depending on whether or not the Collins Road is closed or relocated.

Under either scenario, mining activities would remain at least 0.75 mile from the nearest residence and farther away from the nearest subdivision in this area than allowed under existing conditions. High terrain and an active highway located between the residences and the proposed tract provide visual and audio buffers from current and future mine-related noise. Therefore, the Proposed Action would not cause a significant increase in noise levels at these residences; however, noise from mine-related activities would continue for two years beyond the current life-of-mine estimate.

Southwest of the General Analysis Area

Under the Proposed Action, mining and mine support activities associated with the proposed tract would be at least 0.75 mile farther from the majority of occupied residences than allowed within the existing permit boundary. Mining activities associated with the proposed tract would remain at least 0.5 mile from the nearest residence; that residence is within the permit area and immediately adjacent to an existing lease. Few potential buffers from mine-related noise are present between the majority of residences in this area and current or future mine operations. However, nearly all of the residences in this area are adjacent to and west of a well-traveled major highway and, thus, are currently exposed to regular traffic noise. Based on this factor, the Proposed Action would not cause a significant increase in noise levels at these residences; however, noise from mine-related activities would continue for two years beyond the current life-of-mine estimate.

Noise Impacts on Wildlife

Under the Proposed Action, wildlife in the immediate vicinity of the proposed tract would be exposed to noise from mine-related activities for an additional two years, but noise levels are not expected to increase during that period. Anecdotal observations at surface coal mines in the area indicate that wildlife may adapt to increased noise associated with coal mining activity. After mining and reclamation are completed, noise levels would return to premining levels.

Increase in Noise Levels near the Rail Spur

Under the Proposed Action, the proposed tract would be mined as an extension of existing operations. Annual coal production would not increase, but it would be extended by two years beyond the current life-of-mine estimate. No new railroads or rail loading facilities would be constructed under this alternative; rail car loading would continue at the loadout facility in the existing permit area approximately 1.5 miles southeast of the proposed tract. The nearest occupied residence is approximately 2.25 miles to the northwest, with numerous hills and existing noise sources between the rail spur and the residence. Based on these factors, the Proposed Action would not cause a significant increase in levels near the rail spur.

The mines north of Interstate 90 (including Buckskin) share a common rail spur connecting to the main east-west rail line along the interstate to ship coal to users throughout the U.S. No residences are located near the common rail spur north of the railroad junction. Under the Proposed Action, average coal car loading would remain at the same level as under existing conditions for Buckskin Mine (five trains per day). Railroad noise impacts are usually evaluated

by considering the 24-hour average noise increase compared to existing conditions, rather than evaluating short-term L_{eq} noise impacts from each individual train (Federal Transit Administration 2006). Because the average number of coal trains would not increase, the Proposed Action would not cause an increase in the 24-hour average noise levels along the rail spur.

3.14.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. As discussed under the Proposed Action, previously leased coal reserves and permitted mine operations would be closer to most occupied residences west and southwest of the mine than under either action alternative. Mine operations would remain at least 2 miles from residences to the north of the permit boundary. The nearest residence to the existing permit area would remain less than 0.25 mile north of that boundary. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.14.2.3 Alternative 2

Within the General Analysis Area

Under Alternative 2, mining and mine support activities (e.g., topsoil stripping, stockpiling) described in section 1.1.3.3 could eclipse the single occupied residence within the BLM study area (map 3.4-4A) if the McGee road is closed or relocated, as described in section 2.2.3.1. However, Kiewit does not anticipate pursuing road closure or relocation. Therefore, under Alternative 2, mine-related noise sources would remain several hundred feet from the residence, exposing the residence to greater noise levels when mining is closest and continued noise sources for up to six years beyond the current life-of-mine estimate.

North of the General Analysis Area

Under Alternative 2, mining and mine support activities associated with the BLM study area could extend up to 0.5 mile closer to the occupied residences north of the general analysis area than allowed within the existing permit boundary (map 3.4-4A). Mining activities would remain at least 1.5 miles from the nearest residence. High terrain between these residences and the general analysis area would provide a visual and audio barrier from mine operations. Based on this factor, Alternative 2 would not increase noise levels at these residences; however, noise from mine-related activities would continue for up to six years beyond the current life-of-mine estimate.

West of the General Analysis Area

Under Alternative 2, the majority of mining and mine support activities associated with the BLM study area would be 0.5 to 1 mile closer to these residences than allowed within the existing permit boundary, depending on whether or not the Collins and McGee roads are closed or relocated, as described in section 2.2.1.1 and section 2.2.3.1. Regardless of whether one or both roads is affected, mining activities would remain at least 0.5 mile from the nearest residence and farther away from the nearest subdivision in this area than allowed under existing conditions (map 3.4-4B). High terrain and an active highway located between the residences and the proposed tract provide visual and audio buffers from current and future mine-related noise. Therefore, the Proposed Action would not cause a significant increase in noise levels at these residences; however, noise from mine-related activities would continue for two years beyond the current life-of-mine estimate.

Southwest of the General Analysis Area

Under Alternative 2, mining and mine support activities associated with the BLM study area would be approximately 0.5 mile farther from the majority of occupied residences than allowed within the existing permit boundary. Mining activities associated with the BLM study area would remain at least 0.25 mile from the nearest residence (map 3.4-4B); that residence is within the permit area and immediately adjacent to an existing lease. Few potential buffers from mine-related noise are present between the majority of residences in this area and current or future mine operations. However, nearly all of the residences in this area are adjacent to and west of a well-traveled major highway and, thus, are currently exposed to regular traffic noise. Based on this factor, Alternative 2 would not cause a significant increase in noise levels at these residences; however, noise from mine-related activities would continue for up to six years beyond the current life-of-mine estimate.

3.14.3 Regulatory Compliance, Mitigation, and Monitoring

Mine operators are required to comply with Mine Safety and Health Administration regulations concerning noise, which include protecting employees from hearing loss associated with noise levels at the mines. This agency periodically conducts mine inspections to ensure compliance with the requirements of the Federal Mine Safety and Health Act of 1977.

3.14.4 Residual Impacts

No residual noise impacts are expected.

3.15 Transportation

This section describes the affected environment as it relates to transportation in the general analysis area, and identifies impacts that would result from the Proposed Action and alternatives.

3.15.1 Affected Environment

Transportation facilities near the general analysis area include Highway 14-16; Wyoming State Highway 59 (Wyoming 59); the Collins and McGee roads; unimproved local and access roads; the improved Buckskin Mine access road; the Buckskin Mine rail spur; oil and gas pipelines; electric corridors; and associated rights-of-way (map 3.15-1 and map 3.4-4A). Oil and gas pipelines are shown on map 3.15-2.

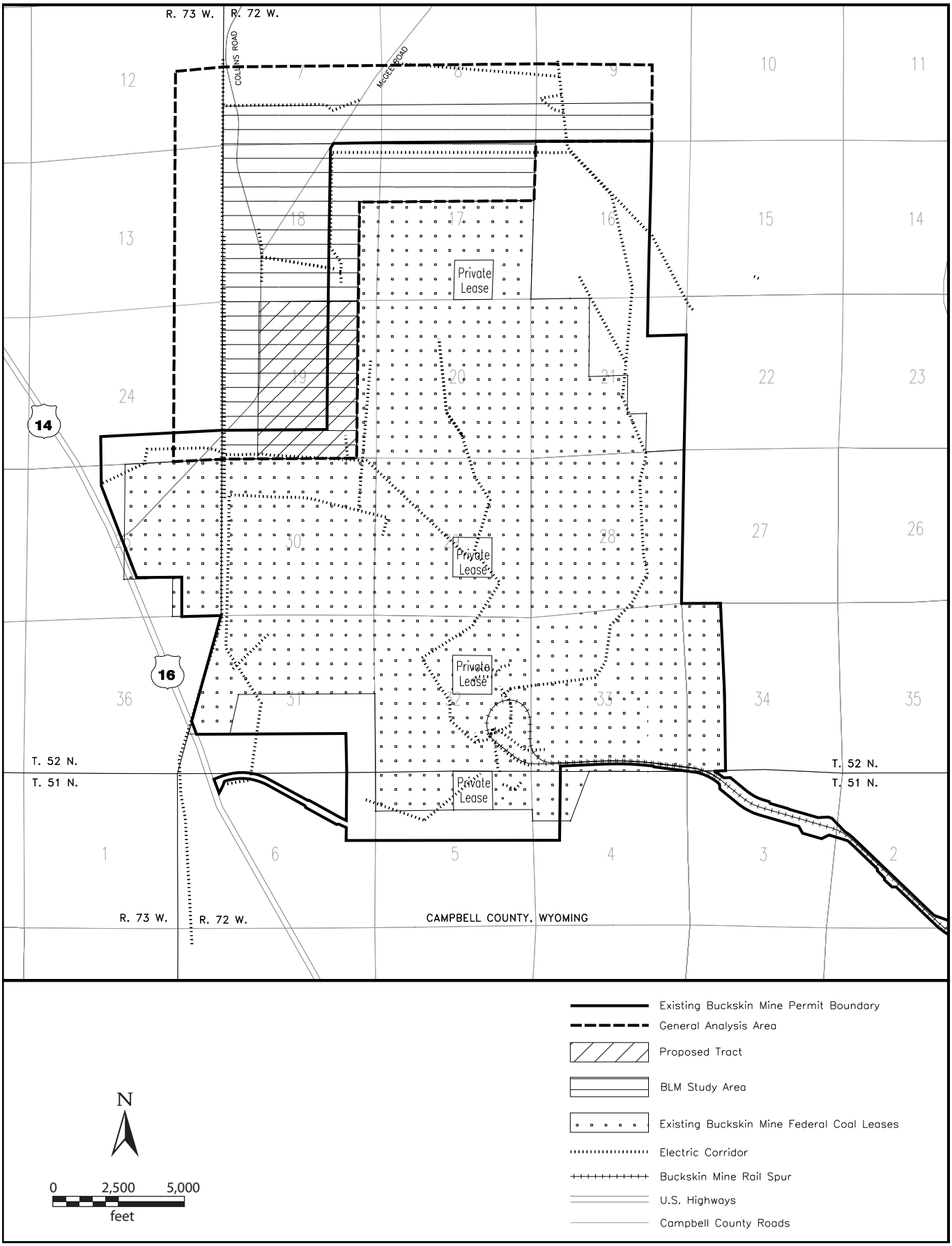
3.15.1.1 Roadways

Highway 14-16 and Wyoming 59 are the major north-south public transportation corridors in this area. Highway 14-16 is approximately 0.5 mile west of the southwestern corner of the general analysis area and approximately 2 miles west of its northwestern corner. It is accessed from the general analysis area via the Collins Road. The Collins Road forms the western boundary of the proposed tract, crossing vertically through the center of the general analysis area. At its intersection with the McGee Road, it continues to the north while the McGee Road angles to the northeast. Wyoming Highway 59 is approximately 2 miles east of the general analysis area; no public access connects that highway with the general analysis area. Both highways are paved, two-lane roads. The county roads are improved, two-lane, dirt roads that also run roughly north-south.

3.15.1.2 Railways

Coal extracted from the existing surface coal mines in the PRB is transported in rail cars along the Burlington Northern Santa Fe (BNSF) and Union Pacific (UP) rail lines. The coal mines north of Gillette, including the Buckskin Mine, ship most of their coal via the east-west BNSF Railroad that runs through Gillette for destinations in the Midwest. The coal mines south of Gillette and in the Wright area ship most of their coal via the Gillette-to-Douglas BNSF/UP joint rail lines that travel south through Campbell and Converse counties, then east over separate BNSF and UP rail lines headed for destinations in the Midwest. Individual spur lines connect each PRB mine to the BNSF or UP mainlines.

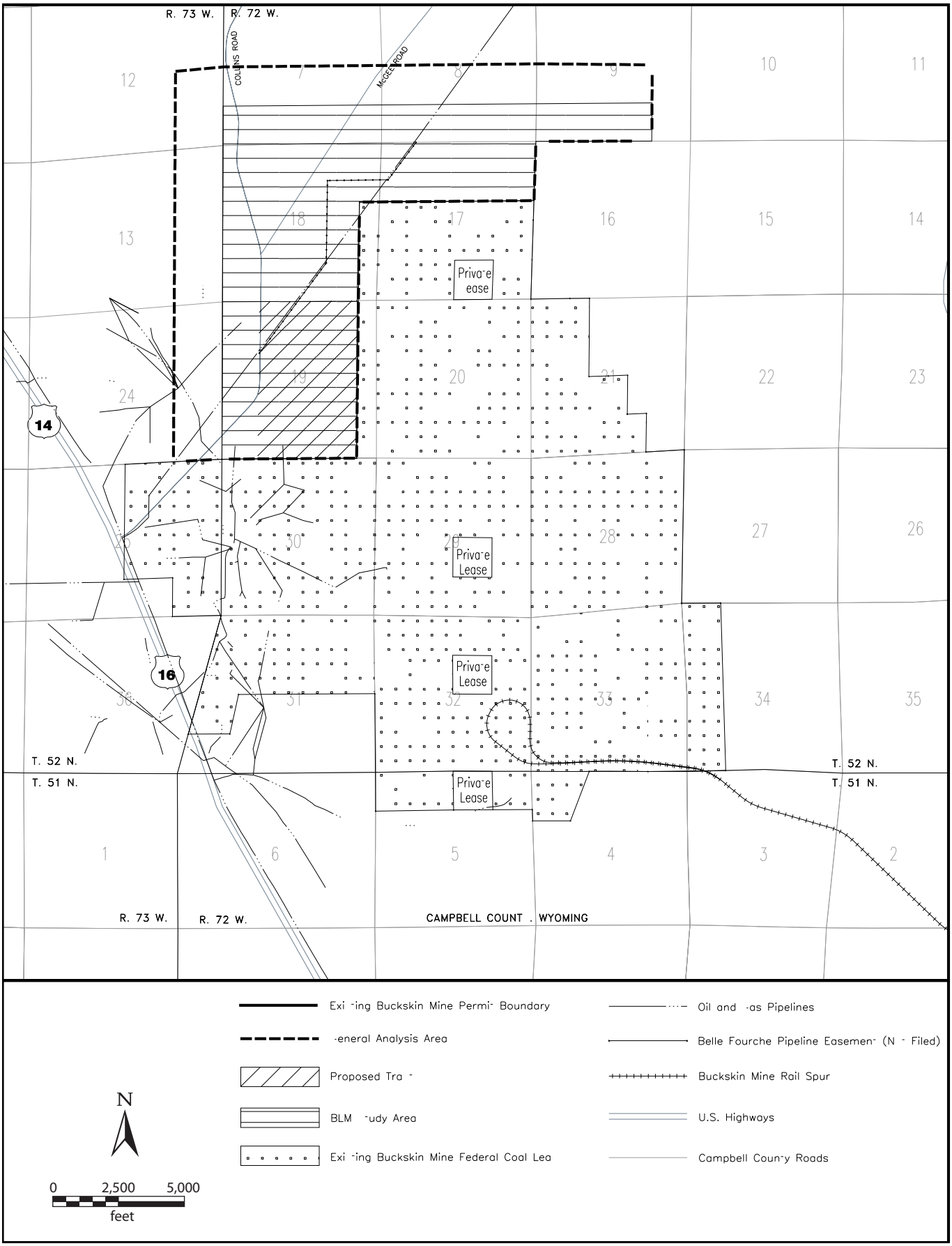
The Buckskin Mine rail spur provides access to the mine and is located approximately 1.5 miles southeast of the general analysis area. This rail spur is the northern terminus of a series of spur lines that serve the surface coal mines north of Gillette and extends south for more than 13 miles.



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.15-1

Transportation Facilities in the Vicinity of the General Analysis Area



No warranty is made by the Bureau of Land Management for the use of the data for purposes not intended by BLM.

Map 3.15-2

Oil and Gas Pipelines in the General Analysis Area

3.15.1.3 Oil and Gas Pipelines and Electric Corridors

Several power lines and active oil and gas pipelines are present in the general analysis area. The overhead, electric transmission and distribution lines traverse the entire area (map 3.15-1) and are primarily associated with mine operations, but they also serve the nearby subdivisions and surrounding homes described in section 3.14. The pipelines are predominately associated with CBNG production, though some oil is transported as well. Two pipelines cross the length of the general analysis area from south to north, but most are concentrated in the southwestern corner (map 3.15-2).

3.15.2 Environmental Consequences

3.15.2.1 Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract could impact one public roadway, two overhead power lines, and three oil and gas pipelines. Temporary surface disturbance from mine support activities (e.g., topsoil stripping, soil stockpiling) in a buffer area to the north of the proposed tract could affect two additional pipelines. The Proposed Action would have no impact on rail lines.

No public roadways are located within the proposed tract, but the Collins Road is adjacent to its western boundary. As described in section 2.2.1.1, lands within 100 feet of the outside line of the right-of-way of a public road are considered unsuitable for surface coal mining. Consequently, the federal coal reserves underlying the Collins Road, its right-of-way, and an associated 100-foot buffer zone cannot be accessed under current conditions. Mining could only occur under the Collins Road or its right-of-way and buffer if the road were closed or relocated, as described in section 2.2.1.1. Kiewit does not anticipate pursuing either of those options, and the road and its right-of-way and buffer are not expected to be disturbed under this alternative. Unless an exception is granted to the BLM's prohibition against mining under or immediately adjacent to a public road (coal screening unsuitability criterion 3, section 2.2.1.1), a stipulation would be attached to the lease stating that mining activity would not be conducted within the Collins Road right-of-way or its 100-foot buffer zone. Vehicular traffic to and from the Buckskin Mine would remain at existing levels, but would continue for up to two years beyond the current life-of-mine estimate.

Coal mined in the proposed tract would be transported by rail. Mining would be an extension of existing Buckskin operations, and would rely on existing rail facilities and infrastructure. Annual coal production would not increase under the Proposed Action, nor would the volume of rail shipments; however, rail shipments would continue for up to two years beyond the current life-of-mine estimate. Three active oil and gas pipelines intersect the proposed tract. Surface disturbance such as overland travel, topsoil stripping, and trenching associated with removal of the existing line and construction of a new line would result if a pipeline is relocated. Minor surface disturbance would also result from relocating and rebuilding the two overhead power lines in the area. Such disturbance is typically limited to overland travel by small- to

medium-sized vehicles and augering holes approximately 3 feet in diameter to accommodate the new power poles.

3.15.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities necessary to support mining on existing leases, described in section 1.1.3.3. Because the overlap area is within the existing permit area, all power line and pipeline issues have already been addressed. No new roads or rail lines would be affected under this alternative. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.15.2.3 Alternative 2

Under Alternative 2, surface coal mining could impact two public roadways, eight overhead power lines, and five oil and gas pipelines. Temporary surface disturbance from mine support activities (e.g., topsoil stripping, soil stockpiling) in a 0.25-mile-wide buffer around the final tract configuration could affect one additional power line and two additional pipelines. Alternative 2 would have no impact on rail lines.

Two public roadways pass through the western half of the BLM study area (map 3.15-1). As described under the Proposed Action, above, and in sections 2.2.1.1 and 2.2.3.1, the coal reserves underlying the Collins and McGee Roads, their rights-of-way, and the associated 100-foot buffer zones are considered unsuitable for mining and cannot be accessed unless one or both roads are closed or relocated. Kiewit does not anticipate pursuing either of those options, and neither road is expected to be disturbed under this alternative. Unless an exception is granted to the BLM's unsuitability criterion 3, a stipulation would be attached to the lease stating that mining activity would not be conducted within the rights-of-way or 100-foot buffer zones for these county roads. Vehicular traffic to and from the Buckskin Mine would remain at existing levels, but would continue for up to six years beyond the current life-of-mine estimate.

Coal mined in the final tract configuration would be transported by rail. Mining would be an extension of existing operations and would rely on existing rail facilities and infrastructure. Annual coal production and volume of rail shipments would not increase, but rail shipments would continue for an additional six years beyond the current life-of-mine estimate. Several active oil and gas pipelines and electric corridors run through the BLM study area. Surface disturbance associated with construction would result if a pipeline is relocated. If relocation of these pipelines or corridors is necessary, it would be handled according to specific agreements between the coal lessee and the pipeline or utility owners.

Multiple power lines and active oil and gas pipelines would be affected under Alternative 2. Surface disturbance such as overland travel, topsoil stripping, trenching, and augering associated

with removal and relocation of associated infrastructure and facilities would result in varying levels of surface disturbance in current and new locations.

3.15.3 Regulatory Compliance, Mitigation, and Monitoring

Regulatory requirements regarding transportation facilities preclude any public road from being relocated or closed unless the appropriate authority has allowed it. Existing pipelines and oil and gas lines can be relocated, if necessary, in accordance with specific agreements between the coal lessee and the pipeline and utility owners. After mining, the land will be reclaimed to support the premining uses described in section 1.1.3.1. Oil and gas wells, pipelines, and utility easements will be reestablished as required.

3.15.4 Residual Impacts

With the opening of the PRB in Wyoming in the late 1970s, U.S. coal shipments have grown dramatically from 4.8 million carloads to 8.4 million carloads in 2006 as the railroads deliver low-sulfur coal to help electric utilities achieve clean air standards. The largest coal trains are from the PRB to power plants in Illinois, Missouri, and Texas (Federal Railroad Administration 2008).

Shifting and blowing coal dust and coal chunks coming off freshly loaded moving railroad cars can accumulate along railroad tracks, railroad rights-of-way, and on adjacent lands. Coal dust can wash into drainages where large deposits of lost coal can accumulate. Accumulated coal dust has been linked to train derailments and can spontaneously combust and cause wildfires.

Coal can be lost from rail cars through leakage from the rail car discharge doors, spillage over the rail car sides, or it can be blown from rail car tops during transit. In testing conducted by Union Pacific Railroad, BNSF, and the National Coal Transportation Association, the average loss of coal from an individual rail car's rapid discharge doors was about 19 pounds per 216 miles, or 0.09 pound per mile. The same testing indicated that an average of 225 pounds of coal was lost from the top of a coal car through either top spillage or being blown off during a 567-mile test trip, which equated to about 0.4 pound per mile (National Coal Transportation Association 2007).

The derailment of two trains in the PRB in 2005 resulted from track instability problems caused by a buildup of coal dust and other particles on the rail bed in combination with high concentrations of moisture (Union Pacific Railroad 2005). BNSF railway officials toured the PRB rail infrastructure in June 2007. According to a BNSF official, when coal dust is blown off rail cars, it becomes lodged in the rail bed, allowing moisture to intrude. The moisture then degrades the structural stability of the rail bed and leaves the rail more vulnerable to buckling under stress (Gartrell 2007a).

The National Coal Transportation Association (2007) testing results suggested that rail car bottom spillage may have more of a negative impact on rail bed stability than loss from the top

of rail cars since the leakage is directly above and near the ballast. The testing also indicated a 32% decrease in bottom spillage of coal after adjustment of the rapid discharge doors.

Accumulating coal dust deposits have become a concern in Converse County. While the coal mines north of Gillette, including the Buckskin Mine, ship most of their coal via the east-west BNSF Railroad to destinations in the Midwest, the majority of coal mined in the PRB travels through Converse County on railroads. Coal dust blows off the freshly loaded coal cars on their way from the mine load-outs to Bill, Wyoming, and through Converse County (Delbridge 2007). The Converse County Board of Commissioners is concerned with the coal dust piles that have accumulated in the county from rail transport of coal.

Spontaneous combustion of accumulated coal dust can cause rangeland fires. Smoldering coal dust in a railroad right-of-way can ignite a wildfire and quickly spread to surrounding private lands if the fire is not immediately controlled. The Douglas Volunteer Fire Department Chief, Rick Andrews, estimates that coal fires account for at least 50% of the department's average summer call volume and are an ongoing problem for them. Often water only temporarily puts down the flames; some fires repeatedly ignite over the course of several hours or days. While the county's rural fire district is compensated for some of the costs involved in putting out fires caused by transported coal, the compensation does not come close to the actual costs, according to the Douglas Volunteer Fire Department Chief (Delbridge 2007).

A Converse County private landowner invited the BLM to examine and survey the coal that had fallen from coal trains traveling through his land. On July 7, 2008, BLM personnel met with the landowner and toured his rangeland, which was adjacent to the railroad right-of-way, about 26 miles north of Douglas, Wyoming. The BLM surveyed various coal accumulations in Box Creek. One area had a coal accumulation 1.8 feet thick. Water runoff washed lost coal from the trains into drainages; the amount of coal deposited varied along the tracks (BLM 2008d).

BNSF is working with the utility companies and the mines to encourage delivery of larger chunks of crushed coal (3-inch versus 2-inch diameter) to reduce the amount of small particles that are created in the crushing process. Another possibility that may help lessen blowing coal dust from trains is the application of surfactant to the tops of loaded coal cars. When applied to coal, the surfactant can stabilize and adhere coal dust to larger coal chunks. Tests have shown that coal dust on railroad tracks can be reduced as much as 95% with surfactant use. The specific surfactant used must meet utility companies' burning specifications (Gartrell 2007a).

A collaborative effort between the the National Coal Transportation Association, PRB mines, and BNSF and UP railroads has resulted in an improved design for a coal loading chute that distributes coal more evenly and produces a lower profile load. Preliminary results have demonstrated that this new design may result in a 30% to 60% reduction in coal dust blowing off the top of cars during the early portion of the route (Union Pacific Railroad 2006).

Converse County Commissioners have formally expressed concerns to the BLM regarding fire, health, and safety issues associated with blowing coal dust from trains. They have stated that the health and wellbeing of Converse County citizens downwind of the railroad tracks continue to be

jeopardized by the lack of coal dust mitigation in the coal mining permit process. The commissioners have recommended that coal dust mitigation be applied as a standard condition of approval before mining permits are issued (BLM 2008e).

As discussed in section 1.3, the BLM does not authorize mining permits nor does it regulate mining operations with the issuance of a BLM coal lease. WDEQ/LQD is the agency that permits mining operations and has authority to enforce mining regulations. In Wyoming, WDEQ/LQD has entered into a cooperative agreement with the Secretary of the Interior to regulate surface coal mining operations. Mitigation and other requirements are developed as part of the mining and reclamation permit. These permits and the provisions they contain must be approved by WDEQ/LQD before mining of federal coal leases can occur.

Other agencies that may be stakeholders in this issue include the Federal Railroad Administration, which implements U.S. Department of Transportation environmental policies related to U.S. railroads, and the National Coal Transportation Association, whose mission includes facilitating the resolution of coal transportation issues to serve the needs of the general public and industry (National Coal Transportation Association 2008).

3.16 Hazardous and Solid Waste

3.16.1 Affected Environment

Potential sources of hazardous or solid waste could include spilled, leaked, or dumped substances, petroleum products, and solid waste associated with coal and oil and gas exploration, oil and gas development, utility line installation and maintenance, or agricultural activities. No such hazardous or solid wastes are known to be present in the general analysis area. Wastes produced by current mining activities at the Buckskin Mine are handled according to the procedures described in chapter 1, section 1.1.3.5.

3.16.2 Environmental Consequences

3.16.2.1 Proposed Action

Under the Proposed Action, hazardous and solid wastes generated in the course of mining the proposed tract would be similar to those currently being created by existing mining operations, but they would continue for two years beyond the current life-of-mine estimate. Wastes generated by mining the proposed tract would be handled in accordance with the existing regulations using the procedures currently in use, and in accordance with WDEQ/LQD-approved waste disposal plans at the Buckskin Mine (section 1.1.3.5).

3.16.2.2 Alternative 1 (No Action)

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Disturbance in the general analysis area

would be limited to its overlap with the existing Buckskin Mine permit area boundary, and would consist of temporary surface disturbance from activities (e.g., topsoil stripping) to support mining on existing leases, described in section 1.1.3.3. Coal removal and any associated waste production would continue on the existing Buckskin Mine leases. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

3.16.2.3 Alternative 2

Under Alternative 2, hazardous and solid wastes generated in the course of mining an alternative tract configuration would be similar to those currently being created by existing mining operations, but they would continue for up to six years beyond the current life-of-mine estimate. Waste handling and disposal procedures would be the same as those described for existing mining operations (section 1.1.3.5), and would be in accordance with WDEQ/LQD-approved waste disposal plans at the Buckskin Mine.

3.16.3 Regulatory Compliance, Mitigation, and Monitoring

Kiewit will adhere to the regulatory requirements for production, use, storage, transport, and disposal of solid waste and hazardous or extremely hazardous materials that result from mining activities, described in section 1.1.3.5. All mining activities involving hazardous materials are and would continue to be conducted so as to minimize potential environmental impacts.

3.16.4 Residual Impacts

No residual impacts associated with hazardous and solid waste are expected.

3.17 Socioeconomics

This section describes existing socioeconomic conditions in Campbell County, the City of Gillette, and nearby unincorporated areas and identifies impacts on those conditions that would result from the Proposed Action and alternatives.

3.17.1 Local Economy

3.17.1.1 Affected Environment

Wyoming's coal mines set a new annual production record of 466.3 million tons in 2008, an increase of about 14.2 million tons (3.1%) over the record 452.1 million tons produced in 2007. Coal produced from 14 active mines in Campbell and Converse counties accounted for approximately 96% of total statewide coal production in 2008 and virtually all of the gain in statewide production from 2007 to 2008 (Wyoming Department of Employment 2009a).

Energy resource development has been the primary stimulus behind a significant economic expansion across the state in recent years. Recent estimates of the state's gross state product

(GSP)[3] highlight the significance of the minerals industry to the statewide economy. Estimates of the 2007 GSP indicate the mining industry, including oil and gas and support activities, accounted for more than 30% of the state's total GSP of $31.5 billion. Statewide GSP climbed by nearly 45% (in nominal dollars) between 2003 and 2007 largely due to the increases in natural gas development and production. The contribution of mining production to the 2007 statewide GSP was more than twice that of the government sector, the next largest sector, and more than three-and-one-half times the contribution of the real estate industry, the next largest private industrial sector (U.S. Bureau of Economic Analysis 2009).

Wyoming, Campbell County, Campbell County School District 1, the City of Gillette, and many other governmental entities across the state receive revenues derived directly and indirectly from taxes and royalties on the production of federal coal, including that at the Buckskin Mine. Such revenues include lease bonus bids, ad valorem taxes, severance taxes, royalty payments, sales and use taxes on equipment and other taxable purchases, and portions of required contributions to the federal AML program and Black Lung Disability Trust Fund. Companies pay lease bonus bids for the right to enter into lease agreements for federal coal.

Current statutorily established allocation formulas presently cap the total annual distributions to local governments from the state's share at levels substantially below the revenues generated by mineral development in the state. Consequently, the bulk of such revenues accrue to the state general fund, budget reserve fund, Permanent Wyoming Mineral Trust Fund, and school foundation and construction budgets. The combined statutory distributions to cities and counties during fiscal year 2007 was $53.5 million, about 2.9% of the total $1.79 billion in federal mineral royalties and severance taxes received by the state. Moreover, distributions to local government are not earmarked for those local entities where the activities are located or the social and economic effects are felt. Instead, the distributions are made to all cities and counties in the state.

In 1994, a study conducted at the University of Wyoming estimated the total fiscal benefit to the State of Wyoming for coal produced in the PRB at $1.10 per ton (Borden et al. 1994). Calculating the estimated total fiscal benefit to the state in 2005 by including half of the bonus bid payments, half of the federal mineral royalties based on current prices, half of the AML fees, and all of the ad valorem taxes, severance taxes, and sales and use taxes for coal produced in Campbell County in 2005 results in an estimated $661 million, or $1.62 per ton (BLM 2006b).

Revenues to the federal government from leasing and production of federal coal include retention of one-half of the lease bonus bids and federal mineral royalties. Bonus bids are paid in five annual installments, with half returned to the state. In 2004 and 2005, BLM held competitive sealed-bid lease sales for six coal tracts (NARO South, Hay Creek, West Hay Creek, Little Thunder, West Roundup, and NARO North). The successful bonus bids for these six sales ranged from 30 cents per ton to 97 cents per ton and totaled $1.69 billion, including

[3] GSP is a measure of the total market value of goods and services produced by the labor, capital, and property in the state, after netting out the value of intermediate outputs imported to the state.

$146.3 million for the Hay Creek tract (BLM 2006b). The bonus bid payments associated with these sales topped $200 million in fiscal year 2006. The remaining bonus bid payments from those past sales, estimated at about $170 million per year to the State of Wyoming, will occur this year and the next fiscal year.

Three sales involving coal in the Wyoming PRB were held in the first four months of 2008. Two of those sales were successful. The Eagle Butte and South Maysdorf tracts yielded bonus bids within the range of the 2004/2005 sales (BLM 2008f). As additional sales are planned, successful sales will generate additional coal lease bonus bid disbursements. Such disbursements to the state are then allocated to fund capital construction projects for cities, towns, and counties; the state's highway fund; community colleges, and schools (Wyoming Consensus Revenue Estimating Group 2007).

Federal mineral royalties (FMR) are collected by the federal government when the produced coal is sold, with a royalty rate equal to 12.5% of the sale price. The federal government retains 51% of the receipts and 49% of the FMR is disbursed to the State of Wyoming. Total FMR disbursements, including coal bonus bid payments to the state in fiscal year 2007 derived from all mineral production (not solely coal), was $927 million (Wyoming Consensus Revenue Estimating Group 2008). In 2006, the Buckskin Mine paid $17.8 million in FMR.

In addition to the FMR, coal mines pay as much as 31.5 cents per ton of surface coal produced to fund AML reclamation programs. The Buckskin Mine payments to the federal mining reclamation program exceeded $6 million in 2006. Historically about 83% of the funds were to be returned to states and tribes with AML problems, subject to adjustments to reflect the actual appropriations authorized by Congress and overall AML program priorities. Future AML payments associated with the proposed coal sales are assumed to be 28.0 cents per ton.

Wyoming historically received about 50% of the AML funds generated by production in the state. Amendments to Title IV of the SMCRA enacted in 2006 altered the structure of the AML program. Under the revised program, Wyoming will receive payments over the next seven years to replace past underpayments stemming from Congressional budget authorizations that were insufficient to fully fund the program. However, the state will not be entitled to receive future distributions from the AML program. Wyoming will receive an equivalent in-lieu amount, of 50%, in the form of grants from general treasury funds. The new funds will be subject to fewer restrictions regarding their use (OSM 2007a, b).

Additional sources of revenue from coal mining include federal corporate and personal income taxes and annual lease rentals paid to the government.

Sales and use taxes are levied by the state and by local governments. Approximately 70% of the revenues generated from the statewide 4.0% levy are retained by the state; the remaining revenues are distributed to the counties, cities, and towns according to statutory formula. In addition, Campbell County levies a 1% general purpose local option tax and a 0.25% specific county option tax. Sales and tax revenues are vital for local governments. Statewide total sales and use tax revenues totaled $922.1 million in fiscal year 2007. Fully $1 of every $6 in

statewide sales and use tax receipts was derived directly from economic activity in Campbell County (Wyoming Department of Revenue 2007). A direct accounting of sales and use taxes paid by coal mining firms is not available; however, it is likely substantial given the operating budgets of the mines.

In 2006, the Buckskin Mine had a total payroll, including benefits and incentives, of $19.3 million. In addition, the mine made outlays of nearly $91 million for non-labor operating expenses, capital investments, permits, licenses, fees, royalties, and taxes. Approximately 60% of the latter sum was spent with vendors and suppliers in Wyoming or paid directly to state and local governments. An internal analysis of the Buckskin Mine's outlays yielded an estimated $1.8 million paid in sales and use taxes in 2006. The total payroll includes $31.7 million in federal mineral royalties, mined land reclamation, and black lung taxes, a considerable portion of which return to Wyoming (Ackermann pers. comm.).

The County, Campbell County School District 1, and several special service districts also rely on ad valorem/property taxes levied on the real property and value of production and benefit from operations of the Buckskin Mine.

Rising production and market values for oil, natural gas, and coal, coupled with increases in production have given rise to dramatic increases in the ad valorem tax bases of producing counties, particularly Campbell County. In 2008, Campbell County had an ad valorem tax base of $4.72 billion, an increase of more than $1.0 billion, or 29% increase in the past three years. Campbell County's total ad valorem tax base accounted for more than 21% of the aggregate statewide assessed value on all real property and mineral production. The coal mining industry accounted for nearly 66% of Campbell County's total assessed value (table 3.17-1). The Buckskin Mine, along with other coal mines and the natural gas industry, are the largest taxpayers in Campbell County.

Table 3.17-1. Contribution of Coal Mining to 2008 Assessed Valuation of Campbell County

Total Assessed Value	Coal Mining (Real Property)	State-Assessed Minerals—Coal	Coal-Related Share of Total[1]
$ 4,772,822,444	$ 258,857,305	$ 2,852,086,593	65.8%

[1] (coal mining real property + state-assessed minerals) / total assessed value = coal-related share of total

Sources: Wyoming Department of Revenue 2008 and Wyoming State Board of Equalization 2008.

3.17.1.2 Environmental Consequences

Federal and state royalties, severance tax, and other revenues generated by leasing and mining coal depend on the eventual sale date and price of coal. This analysis assumes a conservative price estimate of $7.85 per ton of coal. It is approximately 25% below the statewide average price of $10.56 per ton for 2010 thru 2012 (reflecting both contracted and spot sales prices) used by Wyoming's Consensus Revenue Estimating Group to estimate the state's revenues from mineral severance and federal mineral royalty revenues over the next five years (Wyoming Consensus Revenue Estimating Group 2007, 2008). Royalty and severance tax revenues would

increase above the amounts projected in this analysis should actual values be higher, and vice versa. Coal prices increased in 2005, generally in response to concerns over transporting and maintaining adequate stockpiles, but then declined in 2006. According to the Wyoming State Geological Survey, the average spot price of 8,400-Btu coal in the PRB was $11.06 per ton in the second half of 2005 and $9.86 per ton in 2006 (Wyoming State Geological Survey 2008). Prices trended upward in 2007 and the first half of 2008, topping $14.00 per ton for 8,800-Btu coal in April and again in November (U.S. Department of Energy 2008a).

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract[4] is projected to generate $69.2–$87.3 million in federal revenues, $90.6–$108.8 million in state and local revenues (table 3.17-2), and potential bonus bids on the leased recoverable coal ranging from $0.30 to $0.97 cents per ton. The projected revenues are based on the total tons of recoverable coal, and, therefore, are not affected by future production rates.

Table 3.17-2. Projected Major Revenue Increases under the Proposed Action and Alternatives[1]

Item	Existing Buckskin Mine	Additional Under		
		Alternative 1 (No Action)	Proposed Action	Alternative 2
State and Local Revenues	$563.6 million	0	$90.6–$108.8 million	$250.2–$300.4 million
Federal Revenues	$417.0 million	0	$69.2–$87.3 million	$191.0–$241.1 million
Mine Life	14 years	0	2 years	6 years
Additional Employees	0	0	0	0

[1] Includes severance taxes, federal mineral royalties, and payments to the AML and Black Lung Disability funds. Revenues assume an average sale price of $7.85 per ton for coal. State and local revenues include allowances for "in-lieu" amounts for AML, for sales and use taxes on direct purchases by the mine, and ad valorem/property taxes on real property and production, but not the sales and use taxes associated with the indirect and induced activity supported by the mine. The state revenues do not include any allowances for "recapture" revenues from Campbell County School District 1.

The overwhelming majority of the state and local revenues reported above would accrue to the state general fund, budget reserve, and Permanent Wyoming Mineral Trust Fund. Substantial revenue would also go to the Wyoming School Foundation Program and school construction programs. Due to statutorily established "caps" on distributions of federal royalty and severance tax revenues to local government, only a relatively small share of these revenues would go to Campbell County and the City of Gillette.

The Wyoming School Foundation Program is also likely to benefit from revenues generated by the "recapture" provisions of local ad valorem taxation. These provisions are triggered when local school districts collect revenue based on state-mandated property tax levies for education that exceed authorized expenditure levels under the state's funding equalization program. These

[4] Based on the coal production tonnages shown in table 3-1.

provisions require such excess tax revenue to be forwarded to the state for use in funding operations in districts with relatively smaller property tax bases. Campbell County School District 1 is among the few districts in the state that is consistently subject to the "recapture" provisions.

Under the Proposed Action, the local economic activity supported by the mine's wages and local purchases would continue for two years beyond the current life-of-mine estimate.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Currently approved mining operations and associated economic benefits would continue on the existing Buckskin Mine leases for the current life-of-mine estimate; however, the additional years of economic and fiscal benefit under the action alternatives would be lost.

As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future. Successfully leasing the tract in the future would trigger the same types of revenue flows to the federal, state, and local governments, though the magnitude of the revenues could be higher or lower than reported here due to differences in future market prices for coal, tax rates, and other factors.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area[5] would generate $191.0–$241.1 million in projected federal revenues, $250.2–$300.4 million in state and local revenues (table 3.17-2), and potential bonus bids on the leased recoverable coal ranging from $0.30 to $0.97 cents per ton. The projected revenues are based on the total tons of recoverable coal and hence are insensitive to future production rates.

Allocation of revenue would be the same as described for the Proposed Action.

Under Alternative 2, the local economic activity supported by the mine's wages and local purchases would continue for six years beyond the current life-of-mine estimate.

3.17.2 Population

3.17.2.1 Affected Environment

Future residency patterns of the Buckskin Mine's employees would be expected to mirror that of the mine's current workforce. More than 80% of the current workforce resides in or near Gillette, with 12% living elsewhere in Wyoming, and 8% commuting from locations in South Dakota. Because of the proximity of the mine to Gillette, the company does not sponsor bus service for employees to and from the mine as do some of the other mines in the region. Rather, employees drive personal or company vehicles or participate in informal carpools.

[5] Based on the coal production tonnages shown in table 3-1.

The community of Gillette, the county seat, would most likely attract the majority of any new residents due to its current population levels and the availability of services, shopping amenities, and educational institutions.

Campbell County's population climbed from 33,698 in 2000 to an estimated 41,473 in July 2008, ranking it the third most populous of Wyoming's 23 counties (table 3.17-3). The increase represents 23% net growth since 2000, trailing only Sublette County (43%) in terms of population growth rates among Wyoming counties. However, Campbell County ranked first in terms of net absolute population growth with a net gain of 7,775 residents. Natrona County, where Casper, the state's largest city is located, registered the second-largest absolute change, gaining 6,596 residents between 2000 and 2008 (U.S. Census 2009).

Table 3.17-3. Population Change, 2000 to 2008

					Change Since 2000	
	2000	2006	2007	2008	Absolute	Percent
Campbell County	33,698	38,480	40,433	41,473	7,775	23.1
City of Gillette	19,646	23,264	25,031	NA	5,385*	27.4

NA = Not yet available

Source: U.S. Census (2008a and 2009).

* Indicated change is for the period 2000 to 2007.

Gillette's July 2007 population of 25,031, as reported by the U.S. Census Bureau, ranks it the fourth-largest city in the state, behind Cheyenne, Casper, and Laramie. Gillette's net population gain of 5,385 residents led all municipalities in the state by a considerable margin; Casper's net gain of 3,359 residents was the second-largest increase among Wyoming cities and towns (U.S. Census 2008a).

The City of Gillette has long maintained that the Census Bureau population estimates are low. The city's population estimates were 27,533 and 30,636, respectively for December 2006 and 2007: the latter is more than 5,600 residents higher than the census estimates. The city cites updated housing inventories, household demographics, and the extremely low housing vacancy rates for its higher estimates (City of Gillette 2008a). Beyond the direct implications for population, the latter also suggests that the Census estimates overlook households that would qualify as residents but are unable to find housing and consequently are living in local hotels and motels on a longer-term basis (Langston pers. comm.). The city also believes the Census estimates overlook the many single-status workers who reside in the community on a long-term basis, but who maintain a permanent legal place of residence elsewhere.[6] Though they technically are not residents, these individuals place demands on the city and other local public service providers.

[6] Single-status workers are married with spouses or families, or are unmarried but living in household settings, who relocate temporarily for employment purposes but who are not accompanied by other family or household members.

In comparison to the statewide population, the median age of Campbell County residents was substantially lower and it had relatively fewer minority residents, a higher percentage of residents under 18, and a larger average household size as shown in table 3.17-4.

Table 3.17-4. Demographic Characteristics, 2000

Characteristic	Wyoming	Campbell County
Median Age	36.2	32.2
Percent Residents < 18 Years Old	26.1	31.0
Average Household Size	2.5	2.7
Percent Minority Residents	7.9	3.9

Source: PRB Coal Review Task1C Report (BLM 2005b)

The majority of the current population directly and indirectly associated with the Buckskin Mine's current workforce resides in and is already integrated into the Gillette community.

3.17.2.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract would extend the current life-of-mine estimate by two years, but mine employment would be expected to remain the same as under existing conditions (section 1.1.3.2). Consequently, the Proposed Action would not result in any noticeable incremental change in population in Campbell County, the City of Gillette, or nearby unincorporated areas.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Currently approved mining operations and associated employment levels would continue on other existing Buckskin Mine leases. The extension in the life of the mine and associated benefits on population stabilization would be lost. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the BLM study area would extend the current life-of-mine estimate by up to six years, but mine employment would be expected to remain as described under existing conditions (section 1.1.3.2). Consequently, Alternative 2 would not result in any noticeable incremental change in population in Campbell County, the City of Gillette, or nearby unincorporated areas.

3.17.3 Employment

3.17.3.1 Affected Environment

Coal mining processes and productivity have changed substantially in recent times. New technologies and higher-capacity equipment are major contributors to these changes. Local coal mining employment grew rapidly during the 1970s as more mines opened and production climbed. Between 1980 and 1998, overall production rose while the number of mining employees decreased or remained constant. The employment declines followed major capital investments in facilities and production equipment aimed at increasing productivity (BLM 2005b). Since 1998 direct employment in Powder River coal mines has climbed, but relatively slower than production, which has risen by more than 50% (Wyoming Department of Employment 2009a).

At the beginning of 2008, the mining sector, including oil and gas workers, accounted for more than 26% of all wage and salary jobs in Campbell and neighboring Converse counties, more than two-and-one-half times the statewide percentage. Surface coal mines or coal contractors in those two counties directly employed approximately 7,400 people, representing about 23% of the total employment labor force (Wyoming Department of Employment 2009a, 2009b; U.S. Bureau of Labor Statistics 2009).

Total statewide covered employment[7] stood at 276,195 in the first quarter of 2008, nearly 20% higher than the corresponding 230,554 jobs in 2003. Approximately one-out-of-four new jobs added in the state during the five-year period was related to the energy industry, with most of that increase concentrated in support industries for oil and gas development.

During that same period, statewide coal mining employment increased by 1,809 jobs (27%) to 6,614, while total employment in Campbell County grew by 8,010 jobs (29%) (Wyoming Department of Employment 2009b). The recent increases in the numbers of local jobs has affected all industries, but was concentrated in mining, construction, transportation, and local government (Wyoming Department of Employment 2009b and 2009c). The mining sector, which includes the oil and gas industry, accounts for about 28% of all employment and 39% of the total labor wages paid in Campbell County. Coal mining is the major constituent of the mining industry in Campbell County, unlike most other areas of Wyoming where oil and gas development is the primary constituent.

Local labor market conditions reflect the strong economic expansion in recent years, driven principally by energy resource development. Unemployment has been near historic lows with average unemployment dipping below 2.0% in Campbell County in 2008, even as the local labor force has grown due to immigration and the attraction of additional residents into the labor force (U.S. Bureau of Labor Statistics 2009).

[7] Covered employment refers to those full- and part-time, private and government wage and salary workers covered under the state's unemployment insurance program. About 97% of non-agricultural workers are included. Exclusions include insurance and real estate agents on commission; most railroad workers; the self-employed; unpaid volunteers or family workers; members of the military; and many agricultural workers.

The Buckskin Mine provides work for 338 (October 2008) employees. The current employment level resulted from an increase of about 130 employees following the 2004 acquisition of additional reserves in the West Hay Creek coal lease and subsequent increase in production. The mine also purchased additional mining equipment to boost production as it worked to address increased stripping ratios (overburden to coal ratio) in its active production seams. Although the primary purpose of the proposed tract is to support an efficient transition of mining from the current production area to other existing leases, the expansion in reserves associated with the tract would also extend the life-of-mine by two years at current production rates (about 25 million tons per year). The additional reserves associated with Alternative 2 would add up to six years to the life of the mine.

The Buckskin Mine is contemplating the addition of a few additional employees to reach its currently desired staffing levels. Filling these positions, a part of the No Action Alternative, would raise the workforce to 345 to 350 workers (Ackermann pers. comm.). Little or no further change in direct employment is anticipated at the mine in conjunction with either the Proposed Action or Alternative 2, assuming a sustained annual production of 25 million tons per year.

3.17.3.2 Environmental Consequences

Proposed Action

Under the Proposed Action, surface coal mining in the proposed tract would extend the current life-of-mine estimate by two years, but mine employment would be expected to remain the same as under existing conditions (section 1.1.3.2). Consequently, the Proposed Action would have a beneficial impact on the region's labor market by extending the duration of current employment rates at the mine.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Current mining operations and employment levels would continue in association with other existing Buckskin Mine leases. The extension in the life of the mine and associated benefits on continued employment would be lost. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, surface coal mining in the alternative tract configuration would extend the current life-of-mine estimate by up to six years, but mine employment would be expected to remain the same as under existing conditions (section 1.1.3.2). Consequently, Alternative 2 would have a beneficial impact on the region's labor market by extending the duration of current employment rates at the mine.

3.17.4 Housing

3.17.4.1 Affected Environment

The 2000 census tallied 13,288 housing units in Campbell County (U.S. Census 2008b). Population growth since 2000 has prompted new housing construction in the region. According to the Census Bureau estimates, net additions to the number of housing units in Campbell County from 2000 through 2007 total 1,240 units (table 3.17-5). However, for many years construction did not keep pace with demand. Consequently, vacancy rates have fallen to record lows and housing prices have climbed. In the second half of 2007, a survey of rental housing estimated a vacancy rate of just 0.3% (4 units) in Campbell County (Wyoming Housing Database Partnership 2008). Another recent housing survey in Gillette yielded a vacancy rate of 0.1% for rental properties with many complexes reporting significant waiting lists. That survey also estimated a year-end vacancy rate of 2.0% among 11 mobile home parks (City of Gillette 2008a).

Table 3.17-5. Campbell County Housing Inventory, 2000 and 2007

2000	2007	Change
13,288	14,528	+1,240

Source: U.S. Census 2008b

In 2007, a major surge in new residential construction occurred in Campbell County, triggered by pent-up housing demand and anticipated future demands associated with the pending construction of the Dry Fork Station power plant (2008 thru 2010), rising coal production, and continuing natural gas development. The City of Gillette alone issued 986 building permits for new housing units in 2007. That total, consisting of 244 single-family units, 140 duplex units, and 602 multi-family units, nearly equaled the combined total of the previous six years. In addition, the city issued 126 permits for new manufactured homes. At year's end 624 multifamily units were under construction with another 72 units expected to be permitted in early 2008 (City of Gillette 2008a).

In the fourth quarter of 2007, average rental housing costs in Campbell County were $708 for a two-bedroom, unfurnished apartment; $308 for a single-wide mobile home lot; and $1,185 for a two- or three-bedroom single-family home. As compared to the same period in 2006, those averages represent increases of 1.5%, 9.1%, and 21.6% for apartments, mobile home lots, and single family homes, respectively. Within the state, only Teton and Sublette counties have higher costs (Wyoming Department of Administration and Information 2008).

The average selling price of homes in Campbell County in 2006, based on 436 sales, was $199,945. That average was the fifth highest among Wyoming counties, a 7.6% increase over 2005, and an overall increase of 52% in five years (Wyoming Housing Database Partnership 2008).

In addition to permanent housing, a substantial number of temporary or transient housing exists in Campbell County, the City of Gillette, and nearby unincorporated areas. Such housing includes hotels or motels, campgrounds, and some spaces within recreational vehicle (RV)/mobile home parks. Given the tight housing market conditions in Gillette, workers and families waiting for traditional housing to become available are reportedly using some units for longer-term occupancy.

Gillette currently supports 18 motels and inns offering a total of about 1,370 guest rooms; Wright recently opened a 27-room motel (Wyoming Travel and Tourism 2007). Commercial construction permits for a new 80-room motel and a new dormitory to house railroad employees were also issued in 2007 (City of Gillette 2008a).

Gillette has two year-round, commercial campgrounds with approximately 135 hookups for RVs plus tent areas (Wyoming Travel and Tourism 2007). In an effort to address current and anticipated housing needs (particularly those associated with temporary workforces for power plant construction and oil and gas development) Campbell County amended its zoning regulations in 2007 to include a new district for recreational vehicle parks. Such parks can accommodate travel trailers, campers, motor homes, and other recreational vehicles that are commonly used as housing, in a setting that offers centralized laundries, showers, and recreational support activities, as well as utility service and hookups (Campbell County 2008b).

3.17.4.2 Environmental Consequences

Proposed Action

Under the Proposed Action, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be extended by two years beyond the current life-of-mine estimate. Production levels would remain at 25 million tons per year, so no increase in workforce would be necessary to accommodate this rate. Current efforts to add a small number of employees at the mine are unrelated to the coal lease application. Consequently, the Proposed Action would have no substantial impact on population influx or new demands on housing resources in Campbell County, the City of Gillette, and nearby unincorporated areas.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Little change on local housing resources would be expected due to the lack of change in employment at the Buckskin Mine under this alternative. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be extended by up to six years beyond the current life-of-mine estimate. Production levels would remain at 25 million tons per year, so no

increase in workforce would be necessary to accommodate this rate. Production levels would remain at 25 million tons per year, so no increase in workforce would be necessary to accommodate this rate. Current efforts to add a small number of employees at the mine are unrelated to the coal lease application. Consequently, Alternative 2 would have no substantial impact on population influx or new demands on housing resources.

3.17.5 Local Government Facilities and Services

3.17.5.1 Affected Environment

The availability of revenues generated by mineral production has helped local government facilities and services address growing demands for public services. Current facilities and services are generally adequate for the current population, although several service providers are engaged in expansion plans to accommodate future growth and improve service delivery.

Campbell County School District 1, the third-largest district in Wyoming in total enrollment, is the public school district most directly affected by operations at the Buckskin Mine. Total enrollment in Campbell County School District 1 declined by more than 500 students between 1998 and 2004, and climbed by 390 students through the fall of 2007 in response to economic and population growth in the county (Wyoming Department of Education 2008a). The enrollment increase is marked by a disproportionate increase in the number of very young children, i.e., the total number of students enrolled in kindergarten through third grade accounting for more than 70% of the net increase. This pattern is indicative of the recent migration by younger households into the area.

Campbell County School District 1 facilities include 15 elementary schools, 2 junior high schools, and 2 high schools (one with two campuses in Gillette). The school district is in the midst of a five-year plan to replace several schools, modernize others, and complete other major systems maintenance and upgrades. The overall plan is budgeted at more than $57 million. Plans for the next two years include completion of a new elementary school and additions to a high school (Wyoming School Facilities Commission 2007).

The Campbell County Sheriff's Department and Gillette Police Department are the two primary local law enforcement agencies in the county. In addition to general law enforcement throughout the county, the Sheriff's staff provides court security, conducts criminal investigations, operates the detention center, and provides animal control and dispatch for multiple entities.

The Sheriff's office is budgeted for 60 sworn deputies and other employees. Campbell County is proceeding with a major expansion and remodel of the Campbell County detention center. The existing facility has 128 beds, with separate modules for women and juveniles (BLM 2005b). The expansion will add 144 beds for adult inmates along with a separate 16-bed facility for juvenile offenders. Additional space for detention center support functions and departmental administrative, dispatch, and records storage are also included in the expansion (Campbell County 2008a).

The Gillette Police Department has primary responsibility for law enforcement within the municipal boundaries. The department had 70 full-time positions in 2007, an increase of 10 positions as compared to 2005. In part, the increase reflects heightened demands for services associated with a rapid influx of energy-related workers and the corresponding population growth (City of Gillette 2008b).

Fire suppression, fire safety, first responder medical emergency, and hazardous material response throughout Campbell County is provided by the Campbell County Fire Department, which is governed by a city-county joint powers board. The department maintains four stations in Gillette and six rural stations dispersed throughout the county. Construction of a new departmental headquarters facility commenced in 2007. The facility includes administrative office space, training facilities, parking bays for apparatus, and maintenance and storage facilities (City of Gillette 2008a). The Buckskin Mine maintains equipment and trained staff to fight fires on mine property.

The primary medical care facility serving the region is the Campbell County Memorial Hospital, a 90-bed acute care hospital, located in Gillette. The hospital is planning for a major expansion and renovation project that will add 73 new rooms, as well as other diagnostic, treatment, patient-care, and support facilities. Local health care capabilities include a nursing program at Gillette College, housed in a newly completed facility, built by the city. The new Health Science Center provides opportunities for expanded cooperative teaching and training between the college and the hospital.

Ambulance service for Campbell County is provided by the hospital, which has a 24-hour emergency service capability. The Campbell County Fire Department provides first responder service to emergency calls, but transport is the responsibility of the hospital-affiliated ambulance service. Emergency air transport service for severe injuries or critically ill patients is available through Wyoming Life Flight, based in Casper, Wyoming. Wyoming Life Flight provides transport to Wyoming Medical Center, a level 2 trauma facility, and other appropriate regional health care facilities in Billings, Montana, Denver, Colorado, or elsewhere.

The principal water and wastewater utilities are operated by the City of Gillette. The city's water system has ample capacity for its service area for most of the year. However, the system operates near capacity during the peak demand months of June, July, and August. The city recently completed a level II water study to identify longer-term solutions to its water supply problems and is now proceeding to implement its recommendations. High-priority actions include drilling a new well, promoting additional conservation through education and new rate structures, and adopting outside watering/irrigation schedules during the summer (Petersen pers. comm.; City of Gillette 2008a).

Gillette's sewer treatment system was originally designed for a service population of approximately 35,000. Recently completed improvements increased treatment capacity to accommodate a population of 50,000. The city is also proceeding with plans to expand/extend major sewer lines to provide capacity to accommodate new development. Currently, the system

serves in excess of 30,000 residents and visitors in the city and surrounding areas (City of Gillette 2008a).

3.17.5.2 Environmental Consequences

Proposed Action

Under the Proposed Action, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be extended by two years beyond the current life-of-mine estimate. Current efforts to add a small number of employees at the mine are unrelated to the coal lease application. Consequently, the Proposed Action would not increase demands on the existing community facilities or services in the county

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Demand on local government facilities and services would be the same as under existing conditions. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be extended by up to six years beyond the current life-of-mine estimate. Current efforts to add a small number of employees at the mine are unrelated to the coal lease application. Consequently, Alternative 2 would not increase demands on the existing community facilities or services in the county.

3.17.6 Social Setting

3.17.6.1 Affected Environment

The social setting for coal development in the PRB is described in the Task 1C Report for the PRB coal review (BLM 2005b)[8]. That report emphasizes Campbell County and its communities as the nucleus for coal development in the PRB. The Buckskin Mine has been in production since 1981, and the mine and its employees contribute to the social and economic stability of Campbell County and the City of Gillette.

3.17.6.2 Environmental Consequences

Proposed Action

Under the Proposed Action, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be maintained for up to two years

[8] This report is available online at http://www.blm.gov/wy/st/en/programs/energy/Coal_Resources/PRB_Coal/prbdocs.html.

beyond the current life-of-mine estimate. Consequently, the Proposed Action would not affect the social setting of Campbell County or local communities, but would contribute to sustaining it for two additional years.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. The social setting would be the same as under existing conditions. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Under Alternative 2, employment at the Buckskin Mine would be expected to remain the same as under existing conditions (section 1.1.3.2), but would be extended by up to six years. Consequently, Alternative 2 would not affect the social setting of Campbell County or local communities, but would contribute to sustaining it for six additional years.

3.17.7 Environmental Justice

Environmental justice is concerned with actions that have disproportionate impacts on a given segment of society as a result of physical location, perception, design, noise, or other factors. On February 11, 1994, Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations," was published at 59 *Federal Register* 7629. That executive order requires federal agencies to identify and address unreasonably high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations (defined as those living below the poverty level). The executive order makes it clear that its provisions apply fully to Native American populations and Native American tribes.

Communities within Campbell County, entities with interests in the area, and individuals with ties to the area may have concerns about the presence of surface coal mines in the area. Environmental justice concerns are usually directly associated with impacts on the natural and physical environment, but these impacts are likely to be interrelated with social and economic impacts as well. Native American access to cultural and religious sites may fall under the umbrella of environmental justice concerns if the sites are on tribal lands or access to a specific location has been granted by treaty right.

Compliance with Executive Order 12898 concerning environmental justice was accomplished through opportunities for the public to receive information on this EIS in conjunction with consultation and coordination described in section 1.6. This EIS and contributing socioeconomic analysis provide a consideration of the impacts with regard to disproportionately high and adverse impacts on minority and/or low-income groups, including Native Americans.

3.17.7.1 Affected Environment

Economic and demographic data (U.S. Census Bureau 2000 and 2006a) indicate that neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole. Also, the Native American population is smaller than in the state as a whole, and no known Native American sacred sites are located on or near the general analysis area (section 3.12.2.1).

3.17.7.2 Environmental Consequences

Proposed Action

Because neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, the Proposed Action would not have an adverse effect associated with environmental justice.

No Action Alternative

Under the No Action Alternative, the coal lease application would be rejected and no new coal reserves would be mined in the general analysis area. Because neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, the No Action Alternative would not have an adverse effect associated with environmental justice. As discussed in section 2.2.2, a decision to reject the coal lease application would not preclude an application to lease a tract in the general analysis area in the future.

Alternative 2

Because neither minority populations nor people living at or below the poverty level make up a "meaningfully greater increment" of the total population in Gillette or Campbell County than they do in the state as a whole, Alternative 2 would not have an adverse effect associated with environmental justice.

3.17.8 Regulatory Compliance, Mitigation, and Monitoring

Surface coal mines are required to pay royalty and other taxes and fees as required by federal, state, and local regulations. The BLM compares the amount of coal reported as produced with the estimated amount of coal in the ground to verify that royalties are paid on all of the coal that is mined.

3.17.9 Residual Effects

3.17.9.1 Human Health Impact Assessment

In 2008, public concerns were brought to the BLM's attention in regard to conducting human health impact assessments in the PRB where coal mining activities occur. These public concerns included emissions from coal mining activities, such as particulate matter and NO_x exposure, and their potential impact on the health of people living in the local area.

Health impact assessments examine and assess the potential effects of proposed projects on human health on a broad scale, including social, emotional, and cultural, and physical impacts. These assessments rely on available scientific data, public testimony, and modeling to predict potential health impacts. The BLM does not have jurisdiction in regard to conducting human health assessments. However, the BLM has invited the Wyoming Department of Health/Environmental Health Section and the U.S. Center for Disease Control and Prevention to review and provide comment on the draft EIS for the Hay Creek II Coal Lease Application.

In reference to the stated public concerns, air pollution is controlled by state and federal air quality regulations and standards established under the federal Clean Air Act Amendments. State implementation plans are in place to ensure proposed actions such as coal mining comply with all associated air quality regulations and criteria. The WAAQS are stricter than the NAAQS and are enforced by the WDEQ/AQD.

As described in section 3.4.2.3, the WDEQ/AQD in a joint effort with PRB mining stakeholders developed a detailed natural events action plan for the coal mines of Campbell and Converse counties, Wyoming, based on EPA natural event policy guidance. It identifies potential control measures for protecting public health and minimizing exceedences of the PM_{10} NAAQS.

All mines are required to conduct long-term air quality modeling to show that their proposed operations will comply with the NAAQS and WAAQS. They are also required to conduct regular monitoring to demonstrate that their actual air emissions do not exceed these standards. The WDEQ/AQD permit process for coal mines requires air quality modeling of the primary air pollutants PM_{10} and NO_2. Section 3.4.2.3 contains air quality mitigation measures that WDEQ/AQD implemented to prevent exceedences of NAAQS and WAAQS by surface coal mines.

3.18 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Under NEPA, an EIS must include a discussion of the "relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). This requirement is duplicated in the BLM NEPA Handbook Chapter V, Section B.2.a.(3) and C.3.h.(2) (BLM 2008b). This section provides a summary of the residual

impacts of surface coal mining (short-term use) on those resources that have some long-term production capability. Resources such as geology, paleontology, surface water, wildlife use, and others considered "non-producing" are not included in this section.

3.18.1 Local Area

3.18.1.1 Topography

If either action alternative is implemented, coal mining activities would modify almost all components of the present ecological system in the mined tract, which have developed over a long period. In the long term, the land surface would be topographically lower following reclamation. Although the reclaimed surface would resemble original contours, it would have a more homogenous appearance and lack some of its original diversity in shape, structure, and outline.

3.18.1.2 Coal Bed Natural Gas

CBNG is currently being recovered from within the general analysis area, and the BLM's overall assessment of this resource suggests that a large portion of the CBNG resource in the area has been recovered or would be recovered prior to mining under either of the action alternatives. CBNG resources that have not been recovered from the Canyon and Anderson seams prior to mining would be lost when the coal is removed. Luca Technologies Inc. has developed a method of using methanogenisis to produce biogenetic methane. This technique is currently capable of producing up to 30 million cubic feet per day through nutrient enhancement of microbacterial communities; the bacteria metabolize the complex organic molecules in hydrocarbon deposits and produce the gas as a waste product.

Selection of the No Action Alternative (Alternative 1) would not be likely to decrease the total U.S. methane emissions attributable to coal mining in the long term, because numerous other sources of coal exist that could meet the demand even after the Buckskin Mine recovered all of the coal in its existing leases. Likewise, it would not be likely that total U.S. methane emissions would measurably increase in the long term if one of the action alternatives is implemented, because the annual production rate would not increase under either alternative.

3.18.1.3 Air Quality and Visual Resources

Because annual coal production rates and supporting mining activities would continue at current levels under either action alternative, they would not increase existing impacts on the air quality and visual resources in the area on a short-term basis. However, existing effects would continue for two to six years beyond the current life-of-mine estimate. No residual impacts on air quality or visibility are expected following coal extraction, removal of surface facilities, and completion of reclamation.

3.18.1.4 Water Resources

If either of the action alternatives is implemented, groundwater quality after reclamation may differ from premining conditions, but would be similar to the quality in previously reclaimed areas. Water quality would remain adequate for current uses such as livestock and wildlife. Mining would permanently remove any aquifers in the final tract configuration. Groundwater depth would increase in an area extending northwest (upstream) of mining operations due to drawdown from dewatering prior to mining, but should eventually return to premining levels because recharge areas would not be disturbed during coal recovery.

3.18.1.5 Vegetation

The forage and associated livestock grazing present in the general analysis area would be temporarily and incrementally disturbed during mining and reclamation. Croplands and pasture in the area would also be affected. Impacts on native vegetation and producing agricultural lands could occur on up to 2,847 acres due to mining and support activities (e.g., topsoil stripping, soil stockpiling), if the largest possible tract configuration is mined. However, because the county roads in the area are not likely to be closed or relocated, actual new disturbance is expected to be limited to a maximum of 618 additional acres (table 2-4). Any disturbance would occur incrementally over a period of years. Soils would be replaced and vegetation would be restored, as required by the mining plan (section 3.8 and section 3.9). Because the general analysis area is dominated (71% combined) by upland grassland communities and agricultural lands, the establishment of reclaimed grassland communities after mining has been completed would represent similar or somewhat improved habitats, respectively, compared to premining conditions. In the long term, reclaimed lands would provide equivalent or better forage production capacity for domestic livestock. This outcome would be required before the performance bond is released. Long-term productivity would depend primarily on postmining range management practices largely controlled by private landowners.

3.18.1.6 Wildlife and Wildlife Habitat

If either of the action alternatives is implemented, mining would disturb foraging habitat for a variety of wildlife species, particularly those associated with upland grasslands (the combined dominant habitat in the area). Sagebrush obligates such as the sage-grouse would not experience the same level of impacts due to the limited presence (approximately 11%) and broken distribution of shrubs in the general analysis area. Although some wildlife would be displaced or lost in the short term, monitoring of previously reclaimed lands indicates that reclamation can support levels of wildlife abundance and species richness similar to those present prior to mining disturbance over the long term. The timeline for the return to premine wildlife use varies widely by species, with the shortest period for grassland species and longest for species that depend on mature sagebrush, such as the sage-grouse and pronghorn.

3.18.1.7 Recreational Resources

If either of the action alternatives is implemented, short-term impacts on recreational resources could occur from a reduction in big game populations resulting from habitat disturbance and reduction in access to some hunting areas. However, hunting opportunities are already limited due to the dominance of private lands in and around the general analysis area, so these impacts would be minimal. Reclamation efforts would eventually restore wildlife habitats similar to premining conditions, and access to hunting areas affected by mining would presumably be restored as well. Consequently, no long-term adverse impacts on recreation would be expected.

3.18.1.8 Socioeconomic Resources

If either of the action alternatives is implemented, the short- and long-term economy of the region would be enhanced. The Proposed Action would extend the current life-of-mine estimate by two years; Alternative 2 would extend it up to six years (Table 2-4).

3.18.2 Human Health Impact Assessment

In 2008, public concerns were brought to the BLM's attention in regard to conducting human health impact assessments in the PRB where coal mining activities occur to assess the potential impacts of proposed projects on human health. These assessments examine health on a broad scale, including social, emotional, and cultural impacts as well as physical impacts. The impact assessments rely on available scientific data, public testimony, and modeling.

The BLM does not have jurisdiction in regard to conducting specific human health assessments. However, that agency invited the Wyoming Department of Health/Environmental Health Section and the U.S. Center for Disease Control and Prevention to review and provide comment on the Hay Creek II Coal Lease Application EIS. Neither agency was able to provide detailed information due to time and staffing constraints. Information regarding general aspects of human health impact assessments are included in sections 3.4 (Air Quality), 3.5 (Water Resources), 3.14 (Noise), 3.16 (Hazardous and Solid Waste), and 3.17 (Socioeconomics). While this information may not provide a thorough discussion of all aspects of these assessments, it is a summary of credible scientific data and evidence that is relevant to evaluating reasonably foreseeable significant impacts on human health.

Public concerns were largely focused on the potential for exposure to particulate matter and NO_x emissions from coal mining, and the potential impacts of such exposures on the health of people living in the vicinity of surface coal mines located in the eastern PRB.

Air pollution is controlled by state and federal air quality regulations and standards established under the federal Clean Air Act Amendments. State implementation plans are in place to ensure proposed actions like coal mining comply with all associated air quality regulations and criteria. Wyoming standards, WAAQS are stricter than their national counterparts, NAAQS, and are enforced by the WDEQ/AQD. As described in section 3.4.2.3, the WDEQ/AQD developed a Natural Events Action Plan for the coal mines of the PRB. The plan, based on the EPA Natural Event Policy guidance, identifies potential control measures for protecting public health and

minimizing exceedances of the PM_{10} NAAQS, which is the only particulate emission required to be monitored at this time.

All mines are required to conduct air quality modeling to show that their proposed operations will comply with the WAAQS and NAAQS, and they are required to demonstrate through monitoring that their actual air emissions do not exceed the standards. The WDEQ/AQD coal mining permit process requires air quality modeling of the primary air pollutants PM_{10} and NO_2. Section 3.4.2.3 addresses air quality mitigation measures that the WDEQ/AQD has implemented to prevent exceedances of the WAAQS and NAAQS at other PRB surface coal mines.

As stated above and as discussed in section 3.4, maintenance of current annual coal production rates and supporting mining activities under either action alternative would mean that ongoing, short-term impacts on air quality would not increase. However, ongoing impacts would continue for two years beyond the current life-of-mine estimate under the Proposed Action and up to six years under Alternative 2. No residual impacts on air quality are expected following coal extraction, removal of surface facilities, and completion of reclamation.

According to section 3.5.1, postmining groundwater quality may differ from premining quality, but is expected to be quite similar to the premining overburden aquifer and meet Wyoming Class III standards for use as stock water.

While mining is in progress, surface water quality (section 3.5.2) would continue to be protected by directing surface runoff from affected areas to various sediment-control structures including sediment ponds, traps, ditches, sumps, and mine pits. Under normal conditions, exceedances of effluent limitations are not expected in the future as mining extends into new drainages and additional sediment-control facilities are added. After mining and reclamation are complete, surface water flow and quality would approximate premining conditions.

Noise levels in the general analysis area would not increase near most occupied residences in the vicinity; however, existing activities such as blasting, loading, and hauling would continue for two years beyond the current life-of-mine estimate under the Proposed Action, and up to six years under Alternative 2. Projected noise in the general analysis area would be farther from some homes than currently allowed within the existing permit area. The distance and terrain between occupied homes and disturbance area provide visual and audio barriers to the north and west of the general analysis area. Due to the general remoteness of the area, and because mining is already occurring there, noise would have few off-site impacts. No residual noise impacts are expected.

As discussed in section 3.16, wastes generated by mining in the general analysis area would be handled in accordance with the existing regulations using the procedures currently in use and in accordance with the WDEQ/LQD-approved waste disposal plan at the Buckskin Mine. No residual hazardous and solid waste impacts are expected.

As discussed in section 3.17.6, no change in the social setting of Campbell County or the community of Gillette would be anticipated under either action alternative. The Buckskin Mine has been operating for more than 25 years, and the mine and its employees contribute to the

social and economic stability of Campbell County and the City of Gillette. No socioeconomic residual impacts are expected.

Coal mines, including the Buckskin Mine, are under the jurisdiction of the Mine Safety and Health Administration. That agency's mission is to "administer the provisions of the Federal Mine Safety and Health Act of 1977 (Mine Act), as amended by the Mine Improvement and New Emergency Response Act of 2006 (MINER Act), and to enforce compliance with mandatory safety and health standards as a means to eliminate fatal accidents; to reduce the frequency and severity of nonfatal accidents; to minimize health hazards; and to promote improved safety and health conditions in the Nation's mines" (U.S. Department of Labor 2009). While an official health impact assessment is not within the agency's authorization, it does monitor and enforce some of the health and safety standards for mining that are related to these impact assessment issues.

3.18.3 Greenhouse Gas Emissions

Considerable scientific investigation and discussion continue to address the causes of the rise in global mean temperatures and whether a warming trend will continue. This section addresses greenhouse gas (GHG) emissions as specifically related to the Buckskin Mine.

GHGs have been raised as a concern due to the greenhouse effect. Ongoing scientific research has identified the potential impacts of anthropogenic (from human activities) GHG emissions and changes in biologic carbon sequestration on the global climate. Through complex interactions on a regional and global scale, these changes cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat radiated by the earth back into space, much as glass traps heat over a greenhouse. Many GHGs occur naturally in the atmosphere, such as carbon dioxide (CO_2), methane (including CBNG), water vapor, ozone (O_3), and nitrous oxide. Other GHGs are synthetic, such as chlorofluorocarbons, hydrofluorocarbons and perfluorocarbons, as well as sulfur hexafluoride.

Although natural GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused equivalent CO_2 (CO_2Eq) concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. GHGs are not regulated, but a consensus has become established in the international community that global climate change is occurring and that GHGs may play a role. As with any field of scientific study, uncertainties are associated with the science of climate change. This does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty, because they are based on well-known physical laws and documented trends (EPA 2008a).

Climatic change analyses are comprised of several factors, including GHG emissions, land use management practices, and the albedo effect (i.e., the cycle of increased temperature of the environment resulting from increased absorption of normally reflected light). It is assumed that existing land and resource conditions in the general analysis area have been and will continue to be affected by climate change under all alternatives. National and regional data that are available

have been referenced, including a recent comprehensive report, *The Effects of Climate Change on Agriculture, Land Resources, Water Resources and Biodiversity in the United States* (U.S. Climate Change Science Program 2008).

Because the tools necessary to quantify incremental climatic changes associated with these GHG emissions are presently unavailable, the analysis cannot reach conclusions as to the magnitude or significance of the emissions on climate change, or to associate specific actions with the specific climate impacts. The impacts of climate change represent the cumulative impacts of, among other factors, all worldwide GHG and emissions and land use management practices.

As discussed in section 1.3, the BLM does not authorize mining just by issuing a federal coal lease. The WDEQ/LQD, with oversight from the OSM, has regulatory authority in issuing permits to mine coal in Wyoming. However, the BLM considers the impacts of mining coal in this EIS because it is a logical consequence of issuing a maintenance lease to an existing coal mine.

The use of the coal after it is mined is not determined at the time of leasing. However, almost all coal that is being mined in the Wyoming PRB is used to generate electricity by coal-fired power plants in 36 states. A discussion of emissions and by-products generated by burning coal to produce electricity is included in chapter 4, with a more complete discussion of the status of global climate change and cumulative considerations. That chapter also includes an assessment of cumulative impacts related to GHG emissions under all analyzed alternatives.

As discussed in section 2.2.2, under the currently approved mining plan, which represents the No Action Alternative, Kiewit anticipates that Buckskin Mine would mine its remaining estimated 370.4 million tons of recoverable coal reserves in 14 years at an average annual production rate of approximately 25 million tons. Kiewit estimates that the life of mine would be extended by two years under the Proposed Action and up to six years under Alternative 2. Kiewit estimates that the average annual coal production rate of approximately 25 million tons would continue under either action alternative.

To the extent that emission data were available or could be inferred from representative data, potential GHG emissions have been identified that could result from implementation of either of the action alternatives, as well as emissions that would result from the No Action Alternative. The analysis provides a qualitative measure of the incremental change in GHG emissions resulting from the action and no action alternatives. The analysis also provides a measure of the incremental change resulting from these alternatives in relation to GHG emissions from all current coal mining. Because surface coal mining is already occurring at the Buckskin Mine, additional methane would be released into the atmosphere under any of the alternatives.

This study projects emissions for a typical year of operations at the Buckskin Mine, if additional coal reserves are leased and mined in the general analysis area. Emissions are measured as metric tons of CO_2Eq, a conversion to put any of the various gases emitted (i.e., methane or nitrous oxides) into the equivalent greenhouse effect as compared to CO_2. The completed inventory includes emissions from carbon fuels used in mining operations, electricity used on

site (e.g., facility lighting and operation, lighting to illuminate roads, power for electrically operated equipment, and conveyors), and mining processes (e.g., blasting, methane released from mined coal, and spontaneous combustion). Net carbon sink effects from disturbed and reclaimed lands are considered negligible, as the projected annual stripping and reclamation acreages are roughly equal at 200 acres a year. Not included in this CO_2Eq emissions estimate is rail transport, both on site and to the buyers.

Total CO_2Eq emissions per year from the Buckskin Mine are not expected to increase under either action alternative; maximum annual production would not increase and average strip ratios and haul distances would remain substantially the same as under existing operations. Table 3.18-1 summarizes the annual Buckskin Mine CO_2Eq emissions inventory for nominal and maximum permitted production rates.

Table 3.18-1. Estimated Annual CO_2Eq Emissions at the Buckskin Mine

Source	2008 Actual (25 million tons)	At 30 million metric tons per year	At 42 million metric tons per year
Fuel	94,136	107,379	150,331
Electricity	43,212	49,291	69,007
Mining Process	59,228	67,561	94,585
Total of three sources	196,576	224,231	313,923

CO_2Eq = Equivalent carbon dioxide

Source: Air Quality Data Report, available for viewing at the BLM Wyoming High Plains District Office in Casper, Wyoming.

Conversely, projected CO_2Eq emissions over the life of the mine would increase under either action alternative. Although annual average production and associated annual emissions are not expected to increase, CO_2Eq emissions would be extended by two years beyond the current life-of-mine estimate under the Proposed Action, and up to six years under Alternative 2.

The Center for Climate Strategies estimates that activities in Wyoming will account for approximately 60.3 million tons of gross CO_2Eq emissions in 2010 and 69.4 million tons in 2020 (Center for Climate Strategies 2007). Using those projections, the 2008 Buckskin Mine emissions total (table 3.18-1) represents 0.33% of the 2010 statewide emissions.

As mentioned above, the CO_2Eq emission estimates in table 3.18-1 include projected methane emissions vented from exposed unmined coal. The estimated annual amount of CO_2Eq emissions from vented methane is approximately 53,197 tons, or about 27% of the total Buckskin Mine CO_2Eq emissions. Methane emissions from Wyoming's coal mines in 2010 are projected to be 2.3 million tons of CO_2Eq (Center for Climate Strategies 2007), of which the Buckskin Mine's 2008 methane emissions represent 2.3%. Methane emissions from anthropogenic sources in the U.S. in 2007 totaled 699.9 million metric tons CO_2Eq (U.S. Department of Energy 2008b). Therefore, the estimated 2008 methane emissions vented from recovered coal at the Buckskin Mine constitutes about 0.0076% of the total 2007 U.S. methane emissions from anthropogenic sources.

3.18.4 Carbon Sequestration

Information relative to the carbon sequestration legislation was collected from news coverage posted on the internet and websites for the Wyoming Legislative Services Office, U.S. Department of Energy, and EPA.

Carbon sequestration, the process of carbon capture, separation, and storage or reuse, is being researched as a means to stabilize and reduce concentrations of CO_2 (a greenhouse gas). Direct options for carbon sequestration would involve means to capture CO_2 at the source (e.g., power plant) before it enters the atmosphere coupled with "value-added" sequestration (e.g., use of captured CO_2 in enhanced oil recovery operations). Indirect sequestration would involve means of integrating fossil fuel production and use with terrestrial sequestration and enhanced ocean storage of carbon (U.S. Department of Energy 2007a).

The PRB has geologic formations and producing oil and gas reservoirs that are potential target candidates for both enhanced oil recovery and/or deep geologic sequestration. The current limiting factor is the lack of pipeline infrastructure and economic feasibility for CO_2 transmission and use.

Although one enhanced oil recovery project involving CO_2 injection is underway in the PRB (Salt Creek Field) and another is possibly planned (Highlight Field), no geologic carbon sequestration projects currently exist or are currently planned in the PRB at this time. This may change with the advent of new federal legislation, regulations, and economic incentives, particularly those that may combine enhanced oil recovery and sequestration projects or operations.

Additionally, the EPA, from the perspective of considering CO_2 as a waste, is proposing new federal requirements under the Safe Drinking Water Act for the underground injection of CO_2 for the purpose of long-term underground storage, or geologic sequestration. The regulation is being proposed to ensure protection of underground sources of drinking water from injection-related activities. It is currently expected that the final rulemaking will be completed by 2010. This new rulemaking may result in increased interest in using existing, depleted, deep, oil and gas reservoirs, deep saline formations and/or deep coal seams such as found in the PRB.

3.18.5 Regulatory Compliance, Mitigation, and Monitoring

CO_2, methane, water vapor, O_3, and nitrous oxide are all recognized GHGs. Although these gases are not regulated at this time, the EPA is required by the CAA to regulate emissions of six common "criteria air pollutants," including O_3 and nitrogen dioxide (NO_2), from an air quality standpoint. O_3 and NO_2 emissions are monitored at the south Campbell County air quality monitoring sites; monitoring results are included in the EPA AirExplorer database (EPA 2009a). NO_2 is not a greenhouse gas but it can react with other components of the atmosphere to form O_3. O_3 and NO_2 emissions relating to mining in the general analysis area are discussed in section 3.4. Voluntary mitigation measures to reduce mine-specific GHG emissions currently in place at some PRB mines, including the Buckskin Mine, include the following:

- minimizing blast size to the extent possible to reduce CO_2 and NO_2 emissions;

- using different blends of ammonium nitrate fuel oil and slurries and gels used in coal and overburden blasts to reduce CO_2 and NO_2 emissions;
- reducing fuel consumption by restricting equipment idling times, maintaining equipment (e.g., vehicles, compressors, generators) to improve fuel efficiency, and focusing on high-efficiency engines for replacement, thereby reducing CO_2, NO_2, and N_2O emissions; and
- suppressing in-pit coal fires promptly, thereby reducing CO_2 and NO_2 emissions from coal combustion.

3.19 Irreversible and Irretrievable Commitments of Resources

Under the Proposed Action and Alternative 2, the major commitment of resources would be mining and consumption of approximately 54.1 million tons and up to 149.7 million tons of coal, respectively; nearly all of that coal will be used for electrical power generation. CBNG that is not recovered prior to mining would be irreversibly and irretrievably lost (see additional discussion of the impacts of venting CBNG to the atmosphere in section 3.18 and in chapter 4). An estimated 1 to 2% of the energy produced would be required to mine the coal; this energy would also be irretrievably lost.

Under the Proposed Action and Alternative 2, the quality and characteristics of topsoil would be irreversibly changed on 419 acres (plus a buffer area to the north of the tract) and up to 1,883 acres (plus a 0.25-mile-wide buffer), respectively, as a result of mining and mine support activities (e.g., topsoil stripping, soil stockpiling). Actual impacts would likely be limited to 618 acres, under Alternative 2, because Kiewit does not anticipate pursuing closure or relocation of county roads necessary to mine additional reserves. Soil formation processes would continue but would be irreversibly altered during mining and related activities. Newly formed soil material would be unlike that in the natural landscape.

Wildlife deaths resulting directly or indirectly from mining operations or associated activity would constitute irreversible and irretrievable losses, though future recruitment into the population would mitigate those losses to some degree.

Loss of human life could occur as a result of mining operations and vehicular and train traffic. On the basis of surface coal mine accident rates in Wyoming, as determined by the Mine Safety and Health Administration (1997) for the 10-year period from 1987 through 1996, fatal accidents of personnel directly employed at surface coal mines excluding contractors) occur at the rate of 0.003 per 200,000 human-hours worked. Disabling (lost-time) injuries occur at the rate of 1.46 per 200,000 human-hours worked. Any injury or loss of life resulting from mining and related activities would constitute irreversible and irretrievable losses.

Disturbance of all known historic and prehistoric sites in the mined area would be mitigated to the maximum extent possible. However, accidental destruction of presently unknown archeological or paleontological resources, including Native American resources, would constitute irreversible and irretrievable losses.