Environment

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Task 3C Report for the Powder River Basin Coal Review Cumulative Social and Economic Effects

Executive Summary

Introduction

Socioeconomic analysis responds to the public's interest in knowing that decision-makers have considered how people and their communities, lifestyles, and activities would be affected by the management of public lands and resources. The socioeconomic component of the Powder River Basin (PRB) Coal Review study was designed to support these considerations and to disclose their results. By focusing on selected key indicators over a long term, the analysis includes temporal, geographic, and demographic detail that also is helpful in addressing the planning questions of where, when, and how additional community development could be needed in the future as a result of the reasonably foreseeable development (RFD) scenarios identified for this study.

The analysis is based on the two RFD scenarios defined in the Task 2 Report for the PRB Coal Review, Past and Present and Reasonably Foreseeable Development Activities (AECOM 2011) and more recent data through 2010. Assumptions regarding future coal production levels are the primary differentiation between the two scenarios, increasing from 428 million tons per year (mmtpy) in 2010 in the Wyoming portion of the PRB to a projected 473 mmtpy by 2030 under the lower production scenario and to a projected 630 mmtpy under the upper production scenario. Under the lower production scenario, oil and gas development would continue, and three new wind energy projects and one new coal-fired power plant would be built and begin operation. Under the upper production scenario, development activities also would include expansion of an existing rail line and construction and operation of one new rail line and one additional coal-fired power plant.

The two RFD scenarios represent a reasonably foreseeable range of economic activity derived by combining the range of projected future coal production with other identified foreseeable energy development and industrial activities in the Wyoming PRB. This formulation of the RFDs provides a basis for assessing the cumulative socioeconomic effects as a result of ongoing and foreseeable future development activity. Changes affecting non-coal mining activities in terms of levels or timing (e.g., a different sequencing and phasing of new electrical generation capacity, a reduced pace of oil and gas well drilling, or an announcement and commencement of construction of a major new coal technology facility) were identified based on more recent data and considered in the cumulative socioeconomic effects analysis.

REMI Policy Insight (REMI), a regional economic model, was used to develop the cumulative employment and population projections presented below. The version of the REMI model used for this study was calibrated to represent two economic regions: the first consisting of Campbell County alone, and the second composed of the Wyoming counties that border Campbell County and are economically linked to it by established industrial and consumer trade linkages and by workforce commuting patterns. Results for the second region were analyzed to focus on five counties (Converse, Crook, Johnson, Sheridan, and Weston) that are the most directly linked to development influences in the Wyoming PRB. For purposes of this report, the second region is referred to as the five-county area or surrounding counties; the six-county study area refers to the two regions combined. Additional analysis was undertaken to disaggregate REMI's population and employment forecasts for each of the surrounding counties and to derive projected housing requirements and project future school enrollment.

Employment and Personal Income

Employment is an important metric of economic activity and changes in such activity over time, particularly at the county level. It derives that status because: 1) data on employment, unemployment, and labor force are collected and reported monthly with limited time lags; and 2) there is a well established correlation between employment and change in employment levels with changes in population, housing demand, consumer spending, and public sector revenues and expenditures.

Within the Wyoming PRB, energy and mineral development are the principal forces driving economic change. For the RFD scenarios, those forces primarily include changes in coal mining, oil and gas development and production employment, and construction associated with new power plants and rail line expansion and development. Under the lower production scenario, employment in the six-county study area is projected to increase by approximately 5,864 jobs by 2020 compared to 2010 levels, with an additional increase of approximately 4,380 jobs by 2030 (**Table ES-1**). Anticipated increases in coal mine employment within the six-county study area, coupled with the associated secondary impacts from other industries, would account for approximately 22 percent of the total cumulative employment change through 2030.

The net effects of RFD activities under the lower production scenario, including secondary effects on suppliers, retail merchants, service firms, state agencies, and local government in the region, along with underlying economic growth not tied to a specific project, would be the net creation of more than 10,200 new jobs in the region between 2010 and 2030. Of those, more than 3,500 jobs, representing more than a 10 percent increase over 2010 employment, would be based in Campbell County (**Table ES-1**). Also, in contrast to the projected job gains from 2010 to 2020 that would be more concentrated in the surrounding counties, the majority of the projected gains from 2020 to 2030 would be in Campbell County. The key forces shaping the economic outlook during the latter period include a projected increase in coal mine employment, an anticipated increase in CBNG development, and the projected completion of an additional coal-fired power plant.

Table ES-1 Total Employment under the Lower Production Scenario

Location	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	32,824	33,291	36,329	467	3,505	0.5
Surrounding Counties	43,545	48,942	50,284	5,397	6,739	0.7
Six-county Study Area	76,369	82,233	86,613	5,864	10,244	0.6

[1] Source: U.S. Bureau of Economic Analysis 2012.

The employment effects identified above imply continued pressure on local labor markets. Strong demand for labor would contribute to continued relatively lower local unemployment, although periodic spikes in unemployment could occur following the completion of construction projects. Short-term fluctuations in labor markets also could occur in response to changes in natural gas prices that result in higher than anticipated levels of future development, or changes in the market for coal due to shifts from coal-fired to natural gas fueled electrical generation capacity. The upward trend in local employment would stimulate economic migration into Campbell County, causing impacts to population, housing demand, and other economic and social conditions. Similar influences would occur in the surrounding counties, although the implications are less severe because the scale of the effects would be smaller and distributed over multiple communities and service providers.

Under the upper production scenario, employment in the six-county study area is projected to increase by approximately 7,051 jobs by 2020, with an additional increase of approximately 5,675 jobs by 2030 (**Table ES-2**). The net increment, as compared to the employment projections under the lower production scenario, is 2,482 additional jobs by 2030. Most of the incremental gains would be based in Campbell County, further stressing labor markets, housing, and other community resources.

Table ES-2 Total Employment under the Upper Production Scenario

Location	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	32,824	34,381	38,582	1,557	5,758	0.8
Surrounding Counties	43,545	43,049	50,513	5,494	6,968	0.7
Six-county Study Area	76,369	83,420	89,095	7,051	12,726	0.8

[1] Source: U.S. Bureau of Economic Analysis 2012.

The economic expansion associated with the lower production scenario would stimulate growth in personal income across the six-county study area, both in aggregate and on a per capita basis. In 2010, total personal income was $2.12 billion in Campbell County and $3.00 billion in the surrounding counties. Under the lower production scenario, total personal income in Campbell County is projected to increase by almost 160 percent to $5.47 billion (2010 dollars) by 2030. Total personal income in the surrounding counties is projected to increase by 149 percent to $7.47 billion by 2030. Under the upper production scenario, total personal income in Campbell County is projected to increase to $5.78 billion (2010 dollars) in 2030, $310 million higher than under the lower production scenario. Total personal income in the surrounding counties is projected to increase $7.53 billion in 2030, 0.8 percent higher than under the lower production scenario. The gains in total personal income would be reflected in rising real per capita personal incomes across the region.

Population

The magnitude and timing of projected employment changes under either production scenario would trigger corresponding effects to populations across the six-county study area, particularly in Campbell County (**Figure ES-1**).

The economic expansion associated with cumulative development under the lower production scenario would stimulate substantial population growth in the study area, arresting or stabilizing recent trends of declining population. Total population growth of 22,300 residents between 2010 and 2030 is projected across the entire six-county study area, a compounded annual growth rate (CAGR) of 0.9 percent (**Table ES-3**).

Population projections for the lower production scenario are presented by county in **Table ES-3** and shown in **Figure ES-2**. Just over half of the net population growth in the study area through 2020 is projected to occur in Campbell County, with the addition of 9,469 net new residents raising the county's total population to 55,602. The pace of growth would moderate between 2020 and 2030, with a projected net gain in the six-county study area of 4,522 residents.

Population projections for selected communities in the region are shown in **Table ES-4**. As is presently the case, most of the population growth would be concentrated in Gillette, Sheridan, Douglas, and Buffalo.

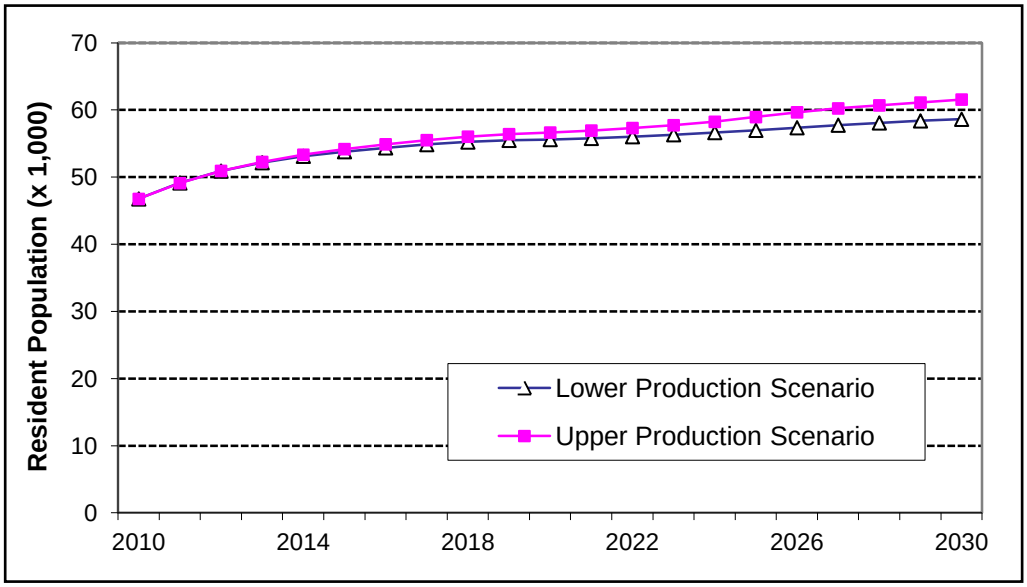


Figure ES-1 Projected Campbell County Population to 2030

Table ES-3 Projected Population by County under the Lower Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	46,133	55,602	58,621	9,469	12,488	1.2
Converse	13,833	16,219	16,670	2,386	2,837	0.9
Crook	7,082	8,159	8,471	1,077	1,389	0.9
Johnson	8,569	9,526	9,955	957	1,386	0.8
Sheridan	29,119	32,202	32,696	3,083	3,577	0.6
Weston	7,206	8,012	7,829	806	623	0.4
Six-county Study Area	111,942	129,720	134,242	17,778	22,300	0.9

[1] Source: U.S. Census Bureau 2011.

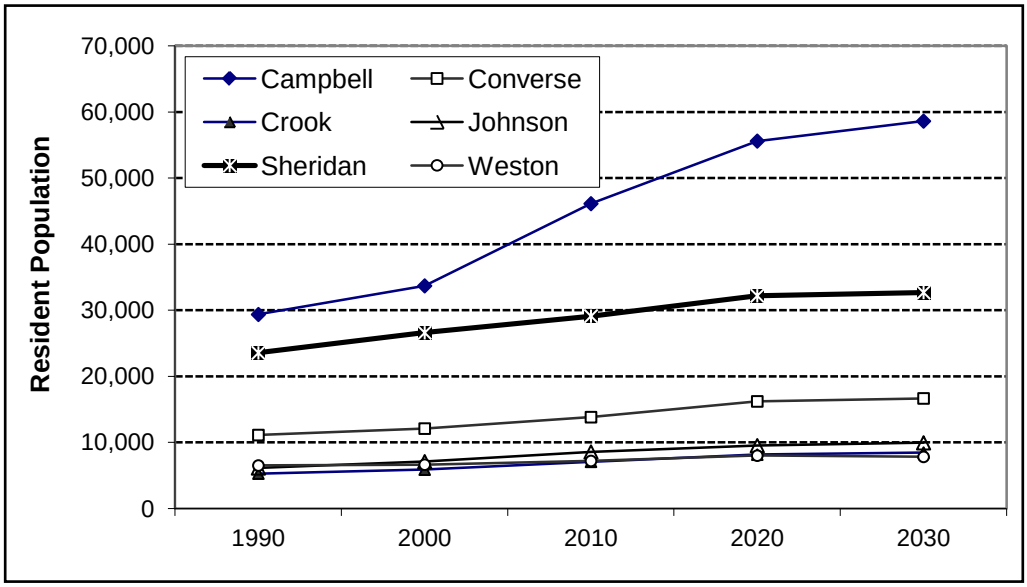


Figure ES-2 Population Growth Trends by County under the Lower Production Scenario

Table ES-4 Projected Population for Selected Communities under the Lower Production Scenario

Community	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030
Gillette	29,087	35,057	36,961	5,970	7,874
Wright	1,807	2,178	2,296	371	489
Douglas	6,120	7,176	7,375	1,056	1,255
Moorcroft	1,009	1,162	1,207	153	198
Sundance	4,019	4,630	4,807	886	788
Buffalo	4,585	5,097	5,327	512	742
Sheridan	17,444	19,293	19,589	1,849	2,145
Newcastle	3,532	3,926	3,836	394	304

[1] Source: U.S. Census Bureau 2011.

As with employment, changing development conditions could result in actual population growth varying from that shown in **Table ES-4**. If schedules or levels of development vary from the projected levels (e.g., delays in construction of the coal-fired power plants, surges in oil and gas development, etc.), there could be corresponding effects on population growth. Additionally, population demographics could change in response to migration and commuting, with relatively more immigrating construction workers being single-status rather than being accompanied by families. Yet another alternative is that the spatial distribution of population growth could shift as a result of housing availability and pricing or labor availability constraints, such that less growth would occur in Gillette and Campbell County with more growth occurring elsewhere.

Projected population growth through 2030 under the upper production scenario is approximately 16 percent higher than under the lower production scenario (25,889 compared to 22,300), with the population in the six-county study area reaching approximately 137,831 by 2030 (**Table ES-5**). Much of the incremental population growth would occur in Campbell County, in particular in and near Gillette.

Table ES-5 Projected Population under the Upper Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	46,133	56,644	61,557	10,611	15,424	1.5
Surrounding Counties	65,809	74,396	76,274	8,487	10,465	0.7
Six-county Study Area	111,942	131,040	137,831	19,098	25,889	1.0

[1] Source: U.S. Census Bureau 2011.

Population growth in selected communities under the upper production scenario would generally mirror growth under the lower production scenario (**Table ES-4**); however, Gillette and Wright would experience somewhat higher growth due to the effects of higher coal production and power generation that would be concentrated Campbell County.

Housing

Both RFD scenarios substantially would increase the demand for housing in the six-county study area. Net new housing requirements under the lower production scenario would require approximately 6,500 additional housing units through 2020, a 13 percent increase above the total existing inventory in 2010. A need for approximately 1,900 additional housing units is projected between 2020 and 2030 (**Figure ES-3**). Net new housing needs under the upper production scenario would require approximately 9,800 additional units through 2030, approximately 1,400 more than under the lower production scenario. Approximately 50 percent of the projected demand for new housing under either RFD scenario would occur in Campbell County. Strong housing demand also would occur in Converse and Sheridan counties.

Both RFD scenarios substantially would increase the demand for housing in the six-county study area, particularly in Gillette. This follows the more rapid increase of 9,775 units that occurred in the study area between 2000 and 2010. The forecasted rate of growth under the upper production scenario, and to a slightly lesser extent under the lower production scenario, would be large enough to exert pressure on housing markets and the housing development and construction industries at a time when demands for labor and other resources already would be high.

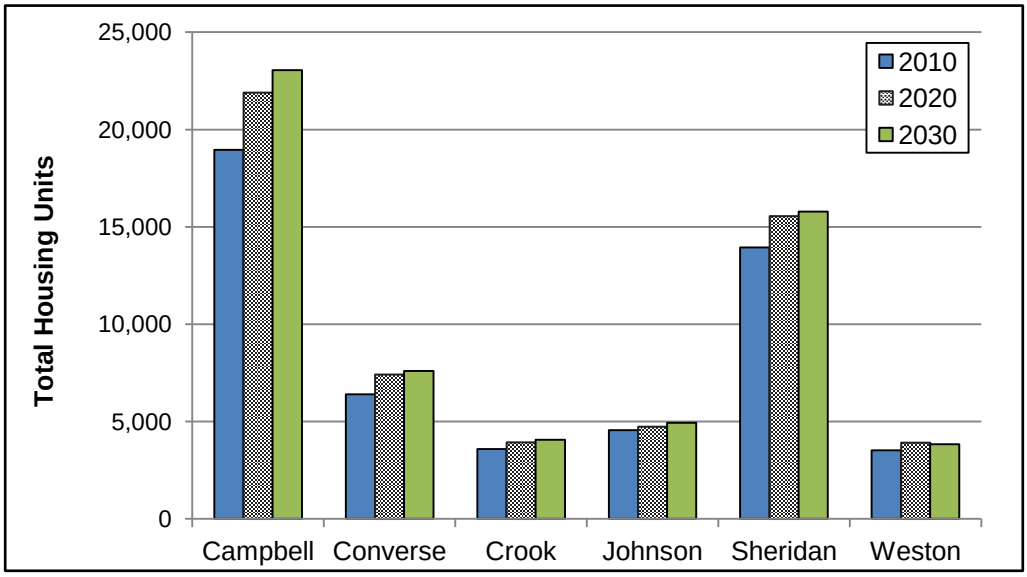


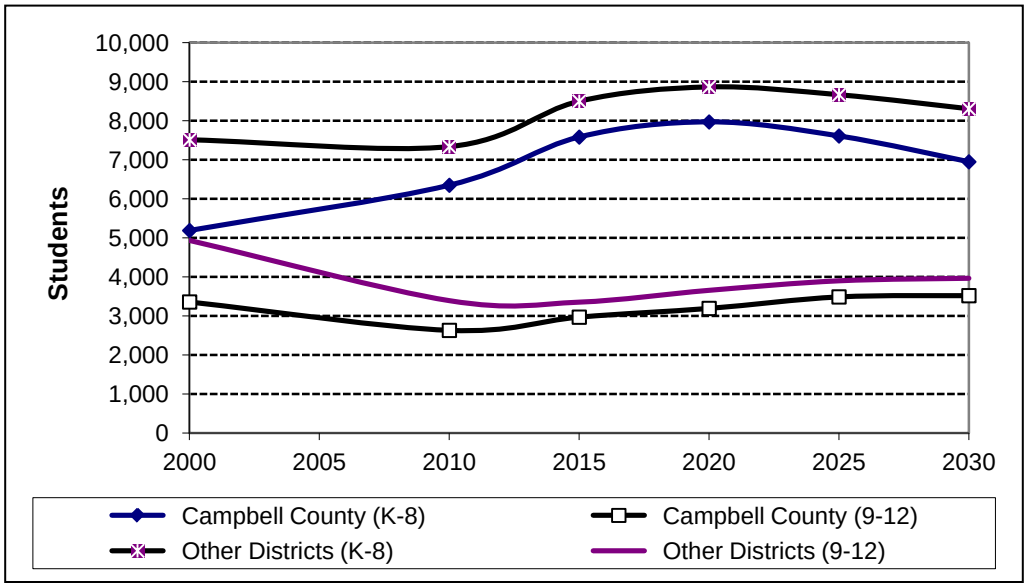
Figure ES-3 Housing Demand by County under the Lower Production Scenario

Public Education

Communities across the six-county study area would experience population growth as a result of economic migration; however, the effect on the size of school-age populations would vary by location. In some counties, the size of that group (ages 5 to 17 years) may even trend in the opposite direction of total population. As the age structure of the population changes, school districts in the study area would be among the public service providers most affected. The demographic forecasts developed from the RFD scenarios project increases in school-age populations over time which would translate to increases in public school enrollments across much of the study area.

Under the lower production scenario, Campbell County would experience a substantial increase in school-age children through 2020 (approximately 2,200 additional children). The increase in school-age children in Campbell County would be concentrated in the lower grades (K-8) through 2020. Beyond 2020, secondary enrollments would increase as the school-age population matures and moves through the system. School districts serving the other counties in the six-county study area, particularly those serving the Sheridan and Douglas communities, also would likely experience substantial increases in school enrollments between 2010 and 2020, followed by declining enrollments through 2030. **Figure ES-4** shows the projected school enrollments to 2030 for Campbell County and the surrounding districts under the lower production scenario.

Under the upper production scenario, the school-age population in Campbell County through 2020 is projected to increase by approximately 2,383 students through 2020, approximately 9 percent higher than under the lower production scenario. The bulk of the increase initially would be felt in the elementary grades but would shift toward the secondary schools over time as the students mature and advance through the system. The net change in the number of students grades K-8 would rise by approximately 1,070 between 2010 and 2030, with a net increase of approximately 1,050 secondary students during the same period. RFD activities under the upper production scenario also would raise the level of enrollment growth in the other five counties in the study area.



Source: Wyoming Department of Education 2012.

Figure ES-4 School Enrollment under the Lower Production Scenario

Under either scenario, forecasted enrollments would likely require additional elementary schools in Campbell County and may require additional middle and high school capacity. Enrollment gains also could result in short-term school capacity shortages in the other districts, depending on the specific grade levels and geographic distributions of the additional students. Under Wyoming School Facilities Commission planning guidelines, impacted school districts generally would be expected to accommodate minor capacity shortages through temporary facilities, such as portable classrooms. For larger, longer-term increases, the Commission's policy is to fund capital expansion where warranted by projections developed during the periodic updates of the school districts' 5 year capital facility plans.

Facilities and Services

The RFD scenarios have the potential to affect local government facilities and services in two ways. First, population increases in affected counties and communities generally result in across the board increases in demand on services, and second, each RFD activity may result in increased demand for specific services (e.g., road maintenance, law enforcement, and emergency response).

Although energy development has the potential to affect all local government facilities and services, particularly in Campbell County, law enforcement, other emergency services, and water supply and wastewater systems would be the primary facilities and services affected by population growth as a result of the RFD activities. The projected population levels under both RFD scenarios would generate the need for additional law enforcement and other emergency personnel in all counties in the study area. All municipal water and wastewater systems should be able to accommodate the projected population increases, with the exception of the Gillette wastewater treatment system and Gillette Regional Water Supply Project which would exceed capacity by or after 2020 under the upper production scenario.

Campbell County and its communities would experience a 27 percent increase in population between 2010 and 2030 under the lower production scenario and 33 percent under the upper production scenario. Under both RFD scenarios, growth rates and the resultant facility and service demand in the other counties within the study area would be substantially less during 2010 to 2030; however, some counties would be required to expand services and some public facilities to accommodate the growth.

Counties and some special districts that would experience increased service demand from energy development also would receive substantial revenues in the form of ad valorem property taxes on facilities and production and, for counties, sales and use taxes on the purchase of materials and supplies. On the other hand, municipalities typically receive little or no property taxes from energy development, relying instead on sales and use tax revenues derived from consumer and business expenditures to fund operations and on other revenues and bonded indebtedness to fund expansion of facilities and services to meet energy-related demand. The residential and commercial growth that accompanies energy development also would generate some property tax revenue for municipalities.

It is important to note that communities in Crook, Weston, and Converse counties that typically host portions of mine, power plant construction, and oil and gas workforces receive no direct revenues from these facilities to fund any increases in service demand. Rather they rely on indirect revenues, such as sales and use taxes derived from local spending, and in the event of a large project that is subject to a Wyoming Industrial Siting permit, they may receive Impact Assistance Payments under the provisions of the Wyoming Industrial Information and Siting Act (WIISA).

Mineral-related Public Sector Revenue Effects

Federal mineral royalties (FMR) and state and local taxes levied on coal and other mineral production are important sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional sources of revenue to support public facilities and services. These revenues benefit not only those jurisdictions within which the production or activity occurs, but also the federal treasury, state coffers, school districts, and local governments across the state through various revenue-sharing and intergovernmental transfer mechanisms.

At the foundation of the mineral development revenue projections are projected levels of future energy and mineral resource production. Based on the projected production and pricing assumptions used in this analysis, the projected value of annual mineral production under the lower production scenario would fluctuate between $7.0 and $7.4 billion through 2030, compared to $6.2 billion in 2010. The aggregate value of energy and mineral resource production under the upper production scenario would peak at approximately $9.3 billion in 2027. The incremental difference, relative to the value under the lower production scenario, would be $2.0 billion per year, all attributable to higher coal production.

The overwhelming majority of future mineral production value considered in this study is anticipated to be derived from coal production in Campbell County. Based on the anticipated drilling rates for CBNG and shifts in coal recovery along the county boundaries in southern Campbell and northern Converse counties, the overall value of production in Converse and Johnson counties is projected to decline over time, while increasing in Sheridan County. Total annual mineral production value under the lower production scenario is projected at $6.2 billion in Campbell County and $1.3 billion in the surrounding counties in 2020, and $6.1 billion and $1.1 billion in 2030, respectively. Under the upper production scenario, projected annual mineral production values in 2030 are $8.1 billion in Campbell County and $1.2 billion in the surrounding counties in the study area.

Between 2010 and 2030, total receipts derived from the key selected sources range between $38.1 and $43.7 billion for the lower and upper production scenarios, respectively. Receipts derived from coal production would account for the majority of the totals under either scenario, with FMR representing the single largest revenue source, ranging from $14.6 to $17.2 billion, for the lower and upper production scenarios, respectively. Including an administrative processing fee levied by the federal government, these revenues accrue to the Federal Treasury and the State of Wyoming on a 51 percent to 49 percent basis (**Tables ES-6** and **ES-7**). Under state revenue distribution formulas established by the Wyoming legislature, revenues collected by the state ultimately benefit the entire state.

Table ES-6 Mineral Development Tax Revenues Associated with Energy Resource Production under the Lower Production Scenario

Resource/Revenue	2011-2015 (million $)	2016-2020 (million $)	2021-2025 (million $)	2026-2030 (million $)	Total (million $)
Coal[1]	7,052.3	8,660.6	8,874.9	8,968.6	33,556.4
CBNG	1,051.0	600.5	714.2	636.7	3,002.3
Conventional Oil and Gas	683.8	423.5	269.2	168.3	1,544.8
Totals	**8,787.1**	**9,684.6**	**9,858.3**	**9,773.6**	**38,103.6**
Severance Tax	2,299.1	2,448.7	2,478.7	2,426.0	9,652.5
FMR	3,624.8	4,057.4	4,158.5	4,131.8	15,972.5
State Mineral Royalties	123.6	72.8	65.2	48.0	309.6
Ad Valorem Tax					
Counties	542.3	576.2	583.8	581.6	2,283.9
School Districts	2,197.3	2,529.5	2,572.1	2,586.2	9,885.1
Totals	**8,787.1**	**9,684.6**	**9,858.3**	**9,773.6**	**38,103.6**

[1] Coal-based revenues exclude coal lease bonus bids due to uncertainties regarding the amount and timing of coal leases and the bonus bids received.

Table ES-7 Mineral Development Tax Revenues Associated with Energy Resource Production under the Upper Production Scenario

Resource/Revenue	2011-2015 (million $)	2016-2020 (million $)	2021-2025 (million $)	2026-2030 (million $)	Total (million $)
Coal[1]	7,196.9	9,650.8	10,711.5	11,559.8	39,119.0
CBNG	1,051.0	600.5	714.2	636.7	3,002.4
Conventional Oil and Gas	683.8	423.5	269.2	168.3	1,544.8
Totals	**8,931.7**	**10,674.8**	**11,694.9**	**12,364.8**	**43,666.2**
Severance Tax	2,341.7	2,709.2	2,947.2	3,080.8	11,078.9
FMR	3,700.1	4,517.9	4,986.7	5,289.1	18,493.8
State Mineral Royalties	123.6	72.8	65.2	48.0	309.6
Ad Valorem Tax					
Counties	546.8	621.6	674.7	712.5	2,555.6
School Districts	2,219.5	2,753.3	3,021.1	3,234.4	11,228.3
Totals	**8,931.7**	**10,674.8**	**11,694.9**	**12,364.8**	**43,666.2**

[1] Coal-based revenues exclude coal lease bonus bids due to uncertainties regarding the amount and timing of coal leases and the bonus bids received.

The federal and state governments also would benefit from coal lease bonus bids derived from future coal leasing. Future coal lease bonus bid revenues would be subject to the timing and size of future leasing actions. Current reserves in the Wyoming portion of the PRB are estimated at 6.8 billion tons. Based on the coal production projections developed for Task 2 (AECOM 2011), and allowing for a further 15 year reserve base at the end of 2030, future leasing of between 8.5 and 12.1 billion tons is foreseeable during the period covered in this assessment in order to maintain an adequate level of reserves for mine planning and operational purposes. Bonus bids have been rising over time, with recent bids in the range of $0.71 to $1.35 per ton (BLM 2012). Future bonus bids could be anticipated to be within that range, generating substantial revenues. Federal lease bonuses also are generated on oil and gas leases, but also are subject to uncertainties with respect to timing and amount. As with the FMR, the lease bonus bids would be disbursed between the Federal Treasury and the State of Wyoming on a 51 percent to 49 percent basis.

Community and Social Effects

Cumulative energy development in the Wyoming PRB, as expressed in the two RFD scenarios, has the potential to generate both beneficial and adverse effects on community social conditions. Social effects of RFD activities in the study area would vary from county to county and community to community under the production scenarios developed for this study, based on the existing social setting and the type of development that would occur.

Beneficial social effects would include lower energy costs, higher standards of living associated with increased income, enhanced economic opportunities, expanded shopping alternatives, and improved community and health care services resulting from economic and population growth and increased tax revenues. Adverse social effects would include rapid population growth resulting in housing shortages; strained community facilities and services; increases in social problems such as crime, substance abuse, and domestic violence conflicts between new and existing populations; and disruptions of community social fabric and ways of life. In many cases, an action can result in both positive and adverse social effects.

The 2010 through 2020 population forecasts associated with both RFD scenarios would represent a continuation of the growth that occurred in Campbell, Crook, Johnson, and Sheridan counties during the 2000 through 2010 period, although at a somewhat slower pace. Converse and Weston counties would grow at a somewhat higher rate during the 2010 through 2020 period compared to the previous decade. Growth rates for all counties would diminish during the 2020 through 2030 period under both RFD scenarios (the population of Weston County is anticipated to decline during this period).

While continued growth could result in some short-term strains on county and community services and housing in some areas, particularly during periods of power plant and mine construction and large scale CBNG or oil and gas development, several factors would likely mitigate against major social disruption. The counties (Campbell, Converse, and Sheridan) and communities (Gillette, Wright, Douglas, and Sheridan) likely to host the majority of the energy development and associated population growth have substantial experience with energy development and have developed planning and management mechanisms to facilitate growth management. Moreover, for major projects such as electric power plants, wind energy facilities, and coal and uranium mines, the provisions of WIISA require disclosure and mitigation of potential community impacts. However, CBNG and conventional oil and gas development are exempt from WIISA; therefore, the potential for adverse community and social impacts of large scale CBNG and conventional oil and gas development is much greater for these industries.

Sheridan County and the communities of Sheridan, Dayton, Ranchester, and other nearby smaller communities could experience social change under both RFD scenarios with the opening of a new coal mine in the county and the expansion of coal mining across the border in Montana. The latter would include a new coal mine and coal conversion project. The City of Sheridan and other communities in the area, potentially including Buffalo in nearby Johnson County, could host workers from these projects,

stimulating new residential and commercial development, more motor vehicle traffic, and increased train traffic, particularly under the upper production scenario. Employment and population growth and diversity likely would be welcomed by many residents, but could present some challenges for the smaller communities in the 2010 through 2020 period. At the same time, some year-round and part-time residents/second-home owners in the area may be unreceptive to the development.

There is, however, potential for conflict and opposition within this general climate of acceptance and support. For the CBNG and conventional oil and gas development industries in particular, split estate issues and concerns relative to hydraulic fracturing, water use, and produced water disposal could result in conflict. Similarly, land use conflicts have risen in conjunction with the siting of wind energy projects within the study area. For all energy development, an active and engaged environmental community at the local, statewide, and national level could intervene in facility siting processes if environmental concerns arise. Moreover, there is an ongoing effort among local and national environmental groups to require consideration of climate change effects in the environmental assessment of coal leases and power plant construction.

List of Acronyms

Bcfpy	billion cubic feet per year
BLM	Bureau of Land Management
BNSF	BNSF Railway
CAGR	compounded annual growth rate
CBNG	coal bed natural gas
CREG	Consensus Revenue Estimating Group
EA	environmental assessment
EIA	U.S. Energy Information Administration
EIS	environmental impact statement
FMR	federal mineral royalties
IAPs	impact assistance payments
LBA	lease-by-application
MMcf	million cubic feet
mmtpy	million tons per year
MW	megawatts
NEPA	National Environmental Policy Act
PILT	payments in lieu of taxes
PRB	Powder River Basin
REMI	REMI Policy Insight
RFD	reasonably foreseeable development
U.S.	United States
USDOI	U.s. Department of the Interior
UP	Union Pacific
WDAI	Wyoming Department of Administration and Information
WIISA	Wyoming Industrial Information and Siting Act
WISD	Wyoming Industrial Siting Division
WOGCC	Wyoming Oil and Gas Conservation Commission
WS	Wyoming Statute
WSFC	Wyoming School Facilities Commission
WSFP	Wyoming School Foundation Program

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1.0 Introduction

The Powder River Basin (PRB) Coal Review is a regional technical study for assessing the existing conditions and the projected future cumulative impacts associated with energy-related past, present, and reasonably foreseeable development (RFD) in the Wyoming PRB and, for specific resources, the Montana PRB. This study is being conducted by AECOM, Inc. (dba AECOM Environment [AECOM]) under the direction of the Bureau of Land Management (BLM) High Plains District Office and Wyoming State Office. The socioeconomic component of the study has been conducted by Sammons/Dutton, LLC and Blankenship Consulting, LLC, under contract to AECOM.

1.1 Study Background

The PRB of Wyoming is a major energy development area with diverse resource and environmental values. Energy development has been occurring in the PRB for well over a century. The first coal mine in the basin was developed in Converse County near Glenrock in 1883 (Foulke et al. 2002). While coal can be found in several areas of Wyoming, the extensive surface-accessible coal resource is what sets the PRB apart from other energy-producing areas of the state and country. The Wyoming portion of the PRB is the largest coal-producing region in the United States (U.S.); PRB coal is used to generate electricity within and outside of the region. The PRB also has produced large amounts of oil and gas resources. Over the last two decades, this region has experienced nationally significant development of natural gas from coal seams (coal bed natural gas [CBNG]).

Federal coal leasing is a high profile activity as over 90 percent of the coal reserves in the PRB are federally owned. The BLM is required to complete a National Environmental Policy Act (NEPA) analysis (environmental impact statement [EIS] or environmental assessment [EA]) for each coal lease-by-application (LBA) as part of the leasing process. In the coal leasing EAs and EISs prepared since the Powder River Regional Coal Team decertified the region in early 1990 (thereby allowing the BLM to use the coal LBA process), cumulative impacts have been addressed in a separate section of the NEPA analyses to highlight the distinction between site-specific and cumulative impacts. With coal leasing expected to continue into the foreseeable future, and with incremental impacts related to oil and gas development since the late 1990s due to development of CBNG in the PRB, the BLM initiated studies and analyses to provide a consistent basis for evaluation of cumulative impacts in the coal leasing EISs. These studies and analyses included the PRB Coal Development Status Check (BLM 1996), Wyodak EIS (BLM 1999), PRB Oil and Gas EIS (BLM 2003), Montgomery Watson Harza (2003) study of PRB coal demand through 2020, and more recently, the PRB Coal Review.

Initiated in 2003, Phase I of the PRB Coal Review included a description of current conditions (Task 1 reports); identification of base year (2003 and subsequently 2007) and RFD and energy-related activities (including future coal production scenarios) for 2010, 2015, and 2020 (Task 2 report); and projected future cumulative impacts (Task 3 reports). Phase II of the PRB Coal Review was initiated in January 2010 to update the Phase I analyses. In Phase II, base year information has been updated through base year 2008, new RFD scenarios (including future coal production) have been developed, and projected cumulative impacts are being analyzed for 2020 and 2030.

The PRB Coal Review provides data, models, and projections to facilitate cumulative analyses for the BLM's future land use planning efforts and for the cumulative impact sections of future coal mine LBA EISs and EAs in compliance with NEPA. It should be noted that the PRB Coal Review is not a NEPA document. It also is not a policy study, analysis of regulatory actions, or analysis of the impacts of project-specific development.

Specific to the socioeconomic analysis, energy resource development in the PRB has been a primary factor affecting social and economic conditions within the basin, although the types and magnitude of

effects have varied by county, community, and time frame. PRB energy resources are a major component of the Wyoming economy and have been a major contributor of state and local tax revenues for more than a quarter century.

The pace of energy resource development in the PRB has been volatile, driven by commodity price fluctuations associated with international and domestic energy demand and policies, environmental regulation and litigation, changing technologies, and product transportation constraints and improvements.

Energy resource development has resulted in economic and population growth in those PRB communities near the energy resources and along transportation routes. Population growth in certain areas of the PRB has been rapid. Energy development is front loaded, in that the size of the workforce needed to develop the resource and supporting infrastructure typically is greater than that needed to produce the commodity. The public service demands of the construction workforce typically occur before the generation of production-related tax revenues, resulting in problems with tax lag-time, wherein local governments are required to provide services to workers in advance of corresponding increases in revenue to fund those services. The tax lag-time disparity diminishes as capital facilities are completed and become operational or as mineral resource production increases over time. Energy development has produced periodic surges in population growth in some PRB communities, occasionally followed by periods of population loss. However, the nationwide growth in energy consumption, coupled with the vast and relatively diverse PRB energy resource base (coal, oil, natural gas, and uranium), has resulted in a 50-year growth trend in Campbell County and other parts of the basin, without the absolute busts and resultant ghost towns that characterize many other western U.S. resource booms.

This period of sustained energy development in the PRB has yielded substantial economic and community development benefits, including economic growth, employment opportunity, tax revenue growth, and infrastructure development for most local governments and for the State of Wyoming as a whole. At the same time, periods of rapid growth have stressed communities and their social structures, housing resources, public infrastructure, and public service systems.

The primary focus of the socioeconomic component of the PRB Coal Review is Campbell County, reflecting the geographic concentration of most of the active coal mines, mining service firms, and production in that county. However, since the coal resource and the associated mining industry is the economic driver for the entire Wyoming PRB, it is necessary also to examine changes and trends in the nearby counties affected most directly by coal mining. Although coal mining in the PRB indirectly affects the entire state and areas far outside Wyoming, the analysis focuses on those immediately adjacent counties in Wyoming affected primarily by a workforce commuting to and from the coal mines. Therefore, the six-county study area for socioeconomic analysis includes Campbell, Converse, Crook, Johnson, Sheridan, and Weston counties (**Figure 1-1**).

It should be noted that a portion of the southernmost active coal mine in the Wyoming PRB, is in Converse County. However, because Converse County overall is more similar to the other adjacent counties than to Campbell County in most social and economic linkages to PRB coal production, it is considered part of the directly affected area but not part of the primary study area for the Task 1C and Task 3C reports. Additionally, the indirect economic, social, or demographic effects in Niobrara and Natrona counties due to coal mining in the Wyoming PRB also were considered in the analysis. It generally is accepted that the impacts in these two counties are limited in scale and are secondary or tertiary level effects arising not strictly from mining per se, but from a related industry or indirect economic linkages.

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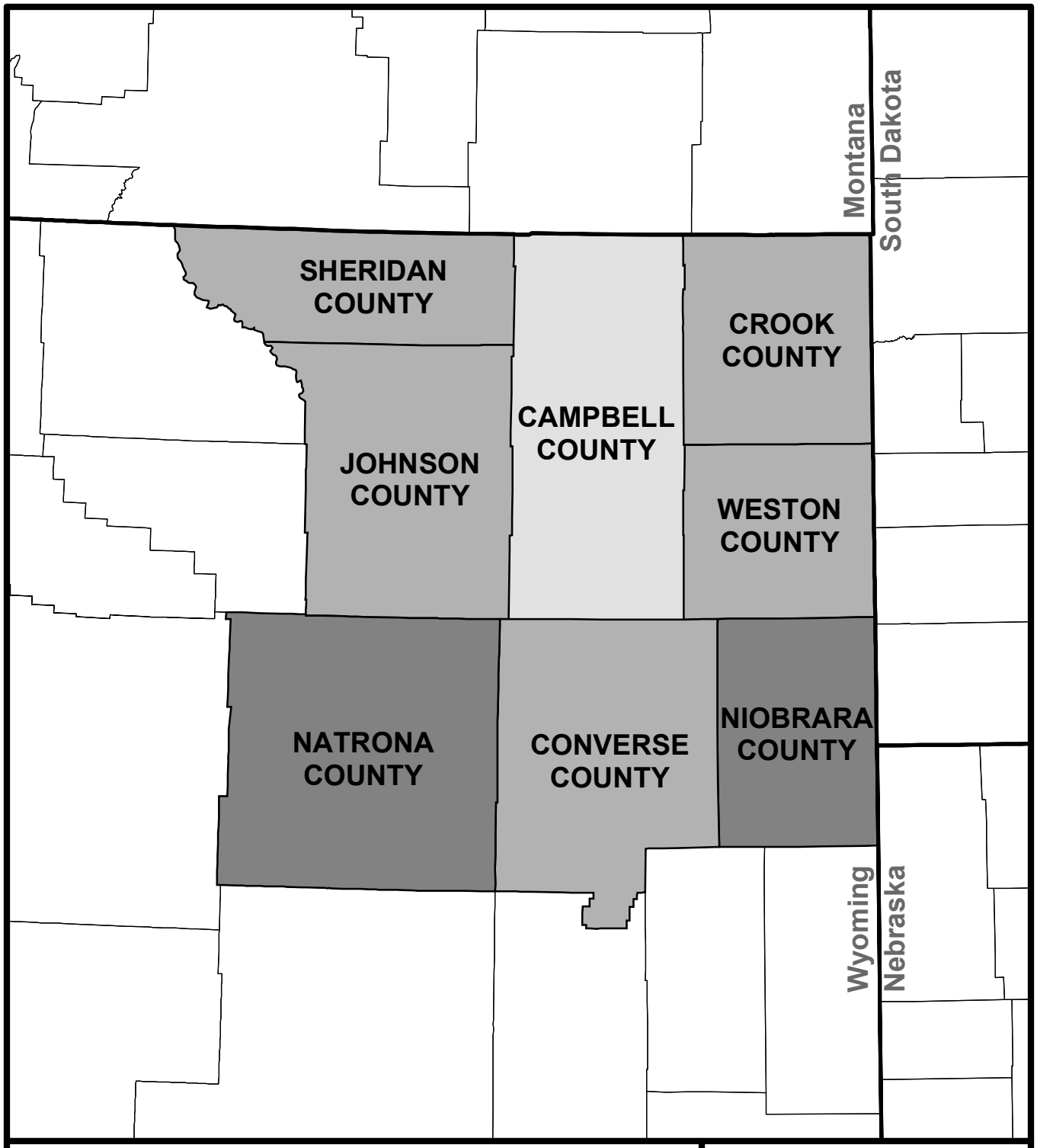


Legend

- Primary study area
- Directly affected area
- Indirectly affected area
- State boundaries
- County boundaries

N
W E
S

0 10 20 30 Miles

0 6 12 18 Kilometers

Powder River Basin Coal Review

Figure 1-1

Social and Economic Study Area

7/16/2012

1.2 Objectives

1.2.1 Phase I

Phase I of the PRB Coal Review was developed as a regional technical study to determine the base year conditions and assess potential future cumulative impacts of projected energy-related development activities in the PRB for years 2010, 2015, and 2020. Specific to the socioeconomic component of the study, the Task 1C report (ENSR 2005a) documented the existing social and economic impacts as of base year 2002, presenting data on coal production and other energy-related development in the Wyoming PRB and associated employment, population, and fiscal indicators.

The Task 2 report (AECOM 2009; ENSR 2005b) identified the past and present development activities in the Wyoming and Montana PRB study area, as well as the projected RFD scenarios in the study area, for years 2010, 2015, and 2020. The RFD scenarios defined in the Task 2 report provided the basis for the analysis of potential cumulative impacts (Task 3 reports). Specific to the socioeconomic component of the study, the Task 3C report (ENSR 2005c) presented the results of the cumulative social and economic impact assessment for projected energy-related development in the Wyoming PRB for future years 2010, 2015, and 2020. The cumulative social and economic impact analysis started with the mathematical modeling of the total effect of change to the regional economy. General concepts like jobs and income were used to measure the impacts, along with estimates of many additional specific economic outcomes.

The study also included the evaluation of base year conditions (Task 1) and projected cumulative impacts (Task 3) for air quality, water resources, and other environmental resources. The results of these analyses were presented in separate stand-alone reports.

1.2.2 Phase II

As with Phase I, Phase II of the PRB Coal Review is a regional technical study to determine the base year (2008) conditions and assess potential future (2020 and 2030) cumulative impacts of projected energy-related development activities in the PRB. Phase II of the study was initiated due to the ongoing energy-related development in the PRB, the elapsed time since initiation of Phase I of the study, and the BLM's need to maintain up-to-date development projections and related projected future cumulative impact analyses for use in the agency LBA EISs and EAs. Under Phase II, the existing and projected future energy-related development activities have been updated (Task 2) based on more recent information, with the air quality, water resources, socioeconomic, and other environmental resources base year analyses (Task 1) and projected cumulative impact analyses (Task 3) correspondingly updated.

The past and present energy-related development activities (including coal mining and CBNG development) for base year 2008 as identified in the Task 2 report (AECOM 2011), provided the basis for the analysis of existing conditions in the PRB study area as presented in the Task 1 reports. Specific to the socioeconomic base year analysis, more recent data were presented where readily available and critical to the analysis. As documented in the Task 1C report (AECOM 2012), data associated with past and present energy-related development were updated based on actual data through 2010 to correspond with the use of the 2010 census data. The geographic focus of the socioeconomic component is the same six-county study area used in Phase I (**Figure 1-1**). The Task 2 RFD scenarios provided the basis for the analysis of potential cumulative social and economic impacts for years 2020 and 2030 presented in this Task 3C report. The PRB Coal Review Task 3 descriptions of projected cumulative impacts for air quality, water resources, and other environmental conditions are presented in separate stand-alone reports.

1.3 Key Issues

Campbell County and nearby areas of the PRB have experienced a series of economic expansions and contractions associated with energy-related development. The more recent wave of activity associated with CBNG development in the region, and the prospect of expanded coal production and expanded electric power generation in the future, raises several social and economic issues for the cumulative impact analysis as identified below:

- What is the character of the local labor market, and how has it historically responded to changing conditions?
- What is the role of migration in terms of past and recent growth?
- To what extent does coal-related development in Campbell County affect the social and economic conditions in neighboring counties?
- How has average labor productivity in the coal mining industry changed, are further changes expected, and what are the implications of future changes for local employment?
- What is the current capacity of key community infrastructure and service systems and what are the constraints for expanding these systems to accommodate future demand?
- What are the fiscal linkages between energy-related development, particularly coal production, and local government finances?
- How have community social conditions changed in response to energy resource development, and what is the current social climate regarding future energy development?

1.4 Agency Outreach, Coordination, and Review

The BLM directed the preparation of this PRB Coal Review. In order to ensure the technical credibility of the data, projections, interpretations, and conclusions of the study and to ensure the study's usefulness for other agencies, the BLM initiated contact with other federal, state, and local agencies early in the Phase I portion of the study. This same approach has been carried forward into Phase II of the study.

As part of this agency outreach and technical oversight, the BLM organized technical advisory groups for the key resources (air quality, water resources, and socioeconomics). These groups were composed of agency representatives and stakeholders with technical expertise in the applicable resources. Relative to the socioeconomic component of the PRB Coal Review, the Socioeconomics Working Group for Phase II included individuals representing community, academic, and government interests serving in a technical review capacity.

2.0 Technical Approach

Socioeconomic analysis responds to the public's interest in knowing that decision-makers have considered how people and their communities, lifestyles, and activities will be affected by the management of public lands and their resources. The technical approach used in this study was designed to support these considerations and to disclose their results.

As an impact topic, socioeconomic effects are difficult to fully disclose, not because information is lacking but because information is abundant and there are many ways to view and interpret it. This study has adopted an approach to the socioeconomic analysis that addresses the complexity of the subject by viewing the task from a long-term planning perspective. A long-term planning perspective focuses on the principal social and economic indicators that typically are tracked by local governments and other providers of community development, social, and educational services. By focusing on selected key indicators, a planning analysis focuses its resources toward developing additional mid-scale temporal, geographic, and demographic detail that can be helpful at the community level. The additional dimensions of detail directly relate to the planner's goal of determining of where, when, and how additional community development could be needed in the future under the Wyoming PRB RFD scenarios.

2.1 Projected Levels of Activity

The projection of future socioeconomic conditions directly depends on economic assumptions associated with the two RFD scenarios that were developed for the PRB Coal Review. The key assumptions underlying the RFD scenarios are summarized in **Tables 2-1** and **2-2**, with the lower and upper coal production scenarios depicted graphically in **Figure 2-1**. The conventional oil and gas and CBNG development projections are depicted graphically in **Figure 2-2**. In keeping with the protocol established in Task 2, the development assumptions are reported for specific milestone years, although they represent activity that would occur during the intervening period since the previous milestone year.

Assumptions regarding future coal production are the primary factors differentiating the two scenarios, with future coal production anticipated under both scenarios: increasing from 428 million tons per year (mmtpy) in 2010 to 461 mmtpy in 2020 and 473 mmtpy in 2030 under the lower production scenario and to 543 mmtpy in 2020 and 630 mmtpy in 2030 under the upper production scenario. Relative to the 2010 annual production, the projected annual coal production in 2030 represents increases of 10.5 and 47.2 percent for the lower and upper production scenarios, respectively. In addition to increased coal production, both scenarios include expansion of electrical generation capacity. The upper production scenario also includes expansion of rail shipment capacity from the PRB.

Imbedded within both the lower and upper coal production scenarios is the startup of two coal mines in the Wyoming PRB study area (School Creek and Youngs Creek) prior to 2020. The 13 currently active coal mines would continue production throughout the forecast period under either scenario. Expansion of coal mining also is assumed in the Montana portion of the PRB, which could indirectly affect social and economic conditions in Wyoming, primarily those in Sheridan County.

Table 2-1 Summary of Wyoming PRB RFD Activity Assumptions

Industry	2010 Existing	Change 2011 to 2020	Change 2021 to 2030	Total Change
Active Coal Mines				
Lower Scenario	13[1]	+2[2]	0	+2[2]
Upper Scenario	13[1]	+2[2]	0	+2[2]
New Conventional Wells Drilled[3]	--	+820	+823	1,643
Active Conventional Oil and Gas Wells (end of period)[4]	3,166	2,783	1,976	-1,190
New CBNG Wells Drilled[3]	--	+5,127	+9,127	+14,254
Active CBNG Wells (end of period)[4]	19,079	8,646	9,127	-9,952
Gas-fired Power Plants	3	0	0	0
Wind Energy Projects	5	+1	+2	+3
Coal-fired Power Plants				
Lower Scenario	6	+1[5]	0	+1
Upper Scenario	6	+1[5]	+1	+2
Operating Railroads				
Lower Scenario	2	0	0	0
Upper Scenario	2	0[6]	+1	+1

[1] Reflects active coal mines only.

[2] Includes the projected new School Creek and Youngs Creek mines.

[3] The projected levels of new conventional oil and gas and CBNG well development are based on the work completed for the Task 2 report (AECOM 2011). The actual levels of future development will reflect responses to market forces and prices and may be higher or lower than projected.

[4] The 2010 number may differ slightly from that reported by the Wyoming Oil and Gas Conservation Commission (WOGCC). The projected numbers of active conventional oil and gas and CBNG wells are based on the work completed for the Task 2 report (AECOM 2011).

[5] The coal-fired Dry Fork station came online in 2011 (Basin Electric 2012).

[6] Although the number of operating rail lines is not projected to change during this time period, upgrades to an existing rail line are projected.

Sources: AECOM 2011; WOGCC 2012.

Table 2-2 Summary of Wyoming PRB RFD Production Assumptions

Industry	2010 Existing	2020	2030	Total Change
Annual Coal Production (mmtpy)				
Lower Scenario	428	461	473	+45
Upper Scenario	428	543	630	+202
Conventional Oil[1] (million barrels per year)	11.35	4.80	1.85	-9.50
Conventional Gas[1] (billion cubic feet per year [Bcfpy])	20.53	12.82	5.99	-14.54
CBNG[1] (Bcfpy)	537.49	158.49	126.90	-410.59
Total Electrical Generation[2,3] (megawatts [MW] of capacity)				
Lower Scenario	1,375.5	2,046.5	2,046.5	+670
Upper Scenario	1,375.5	2,046.5	2,746.5	+1,370
Railroad Coal-hauling Capacity (mmtpy)				
Lower Scenario	700	700	700	0
Upper Scenario	700	750[4]	850	+150

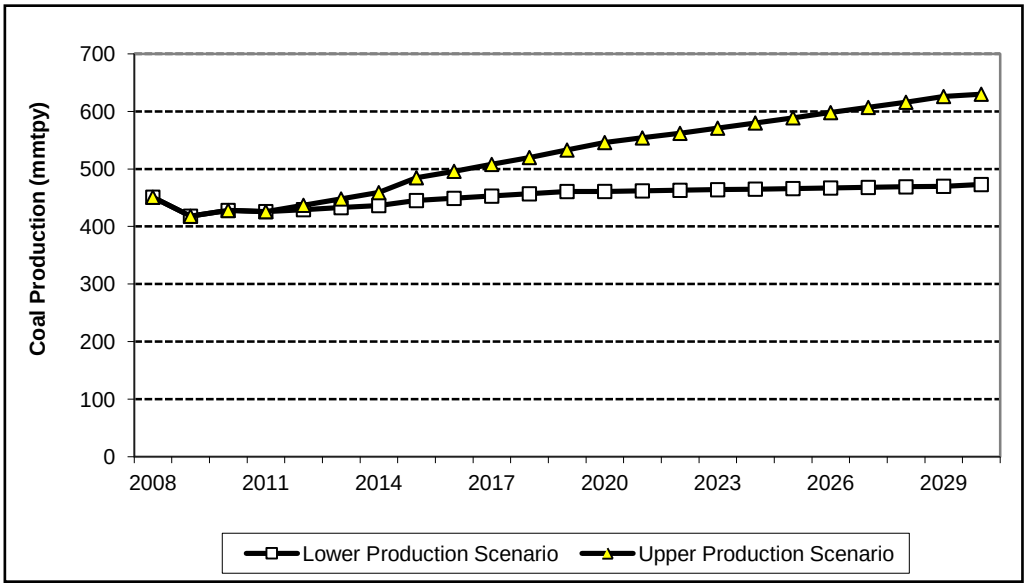
[1] Projected oil and gas production for this Task 3C report reflects the number of new wells projected to be developed in Campbell, Converse, Sheridan, and Johnson counties as identified in the Task 2 report (AECOM 2011), the actual production in 2010 per the WOGCC (2012), and projected future annual production derived using a decline curve methodology. Actual levels of future development and production will respond to market forces and prices and may differ from those projected.

[2] Reflects total capacity from wind energy, coal-fired power plants, and gas-fired power plants. The projected levels of future production capacity include the coal-fired Dry Fork station (actual maximum rating of 422 MW [Basin Electric 2012]) that came online in 2011 and the Reno Junction Wind Project (150 MW). Although permitted, the status of the latter currently is uncertain (Wyoming Industrial Siting Division [WISD] 2012).

[3] Task 2 (AECOM 2011) projected two additional 99 MW wind energy projects by 2030. For Task 3C, that assumption was refined to assume completion of one project by 2020 and the other by 2030.

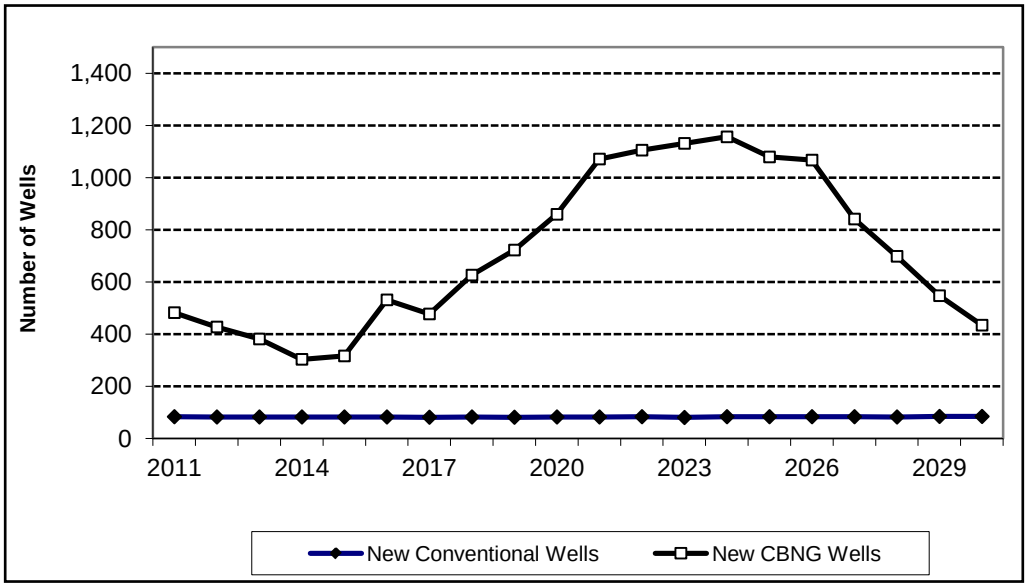
[4] Reflects capacity expansion of the existing joint Union Pacific (UP) and Burlington Northern Santa Fe (BNSF) rail line.

Sources: AECOM 2011; EIA 2011; WOGCC 2012; Wyoming State Inspector of Mines 2012.



Sources: AECOM 2011; Wyoming State Inspector of Mines 2012.

Figure 2-1 Actual and Projected Annual Coal Production in the Wyoming PRB to 2030

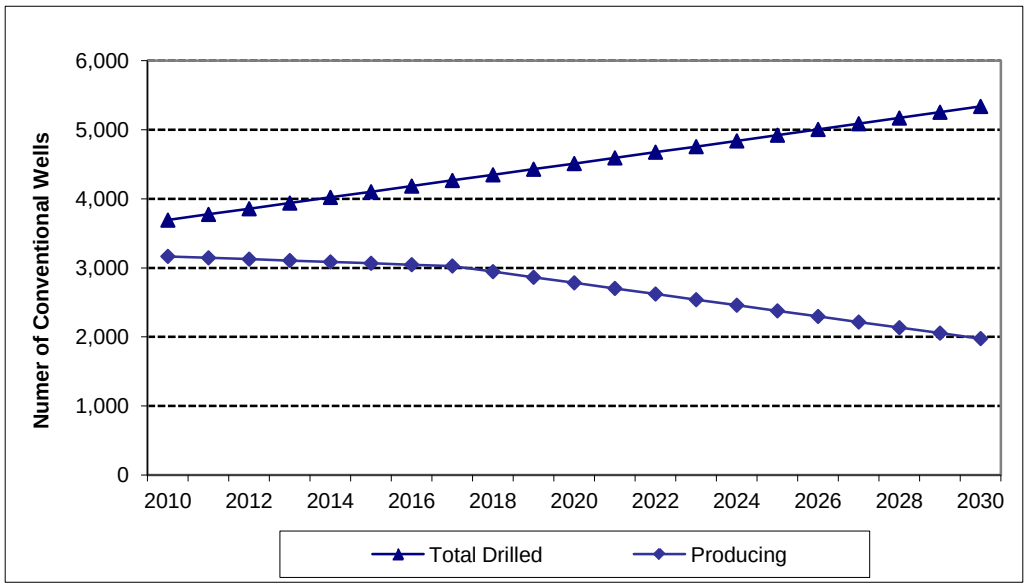


Source: AECOM 2011.

Figure 2-2 Projected New Conventional Oil and Gas and CBNG Wells Completed in the Wyoming PRB (2011 to 2030)

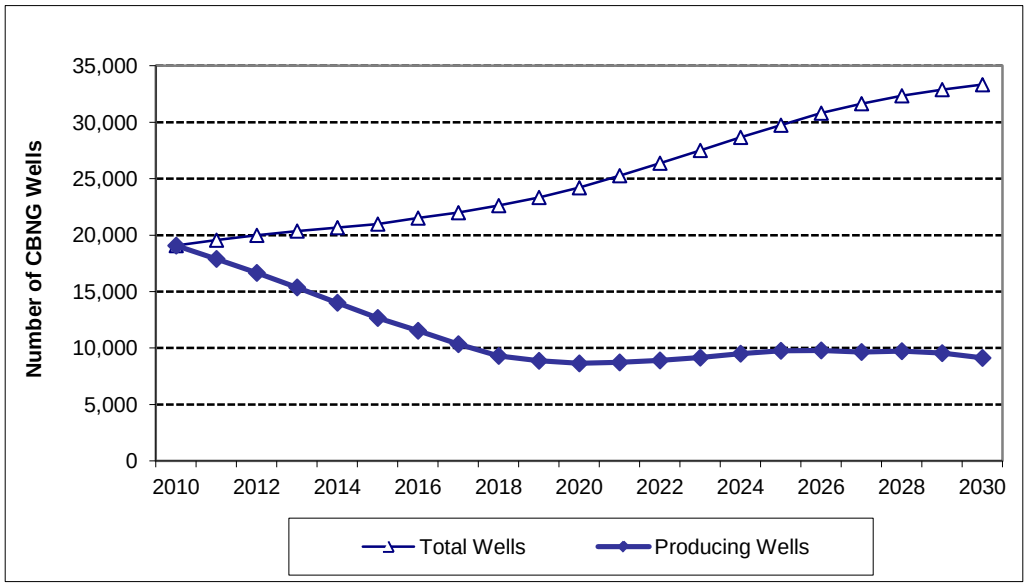
Under both the lower and upper production scenarios, it is projected that one 230-kilovolt transmission line would be constructed by 2015. One additional transmission line could be constructed by 2030. However, the timing and location of such a transmission line is speculative; therefore, it has been excluded from this analysis. The proposed 150-MW Reno Junction wind energy project was anticipated to be operational by 2012; however, construction has not been initiated and its current status is uncertain (WISD 2012). It was assumed for this analysis to be operational by 2015 under both the lower and upper production scenarios. Two additional wind energy projects, each with a rated capacity of 99 MW, also are assumed to be constructed and operational during the analysis period; for this analysis, one was assumed by 2020 and the other by 2030.

Cumulative development assumptions for oil and gas between 2010 and 2030 include 1,643 additional conventional oil and gas wells and 14,254 additional CBNG wells (**Table 2-1**). Both of these development levels are considerably lower than the comparable assumptions in Phase I. In part, the differences reflect the actual development that has occurred since Phase I was completed; however, changes in economic conditions also play a part. The future levels of new conventional oil and gas and CBNG development were combined with assumptions regarding annual drilling rates, success rates, average well life, and typical production per well to derive summary profiles of the oil and gas industry activity over time. Those profiles are shown in **Figures 2-2**, **2-3**, and **2-4**.



Source: AECOM 2011.

Figure 2-3 Cumulative and Producing Conventional Oil and Gas Wells in the Wyoming PRB from 2010 to 2030



Source: AECOM 2011.

Figure 2-4 Cumulative and Producing CBNG Wells in the Wyoming PRB from 2010 to 2030

Future new conventional oil and gas well development is assumed to proceed at a steady pace of approximately 82 wells per year through 2030. Consequently, approximately 820 additional conventional oil and gas wells are projected through 2020, with a comparable number in the following decade. Based on the drilling rates outlined above and the remaining economic lives of existing wells, the number of active producing conventional oil and gas wells will decline steadily over time, falling below 3,000 in 2018 and below 2,000 in 2030 (**Figure 2-3)**.

It is projected that over 5,000 additional CBNG wells would be developed from 2010 through 2020, and approximately 9,100 new wells would be developed during the subsequent decade. By 2020, the cumulative number of CBNG wells developed in the Wyoming PRB is projected to exceed 24,000, climbing to more than 33,000 by 2030 (**Figure 2-4**). The projected annual pace of CBNG development over the analysis period averages approximately 710 wells per year, substantially lower than the nearly 3,000 new CBNG wells developed in 2005 at the height of the CBNG boom.

Annual production projections corresponding to the development parameters outlined above are shown in **Table 2-2**. Based on estimated production from both existing and new wells, annual oil production from the Wyoming PRB is anticipated to decline over the entire cumulative analysis period from 11.35 million barrels in 2010 to 4.8 million barrels in 2020 and to 1.85 million barrels in 2030.

Conventional natural gas production is anticipated to follow the same general production pattern as oil, declining from approximately 20.53 Bcfpy in 2010 to 12.82 Bcfpy in 2020, and approximately 5.99 Bcfpy in 2030; a net decline of approximately 70 percent.

As indicated in the production assumptions presented in **Table 2-2**, CBNG production is assumed to decline from 537.49 Bcfpy in 2010 to 158.49 Bcfpy in 2020 (an approximately 70 percent decrease), and decrease to 126.90 Bcfpy by 2030. [Note: Projected annual CBNG production projections in this Task 3C report differ from those developed under Task 2. While the differences would translate into effects in the timing of production-related employment and public sector revenues, they would not substantively alter the overall cumulative assessment of social and economic effects.]

The underlying causes for the overall decline between 2010 and 2030 include the more moderate levels of future development anticipated as compared to past levels of development coupled with the rapid declines in production after several years that is typical of CBNG wells. The more moderate pace of development reflects the current (2012/13) market prices for gas, which adversely affect the economic viability of drilling, and the diminishing opportunities for new wells given the cumulative previous drilling.

Electrical generating capacity within the Wyoming PRB would increase by approximately 49 percent under the lower production scenario, from 1,375.5 MW in 2010 to 2,046.5 MW by 2030. An additional 700 MWs of coal-fired capacity, over and above the incremental capacity added under the lower production scenario, is assumed to come online in Campbell County by 2030 under the upper production scenario. This would raise the total generating capacity in the PRB to 2,746.5 MW, representing a net increase of 99 percent in electrical generating capacity between 2010 and 2030.

Current railroad capacity to ship coal from the Wyoming PRB (700 mmtpy) would not increase under the lower production scenario. Under the upper production scenario, rail shipment capacity would increase to 750 mmtpy by 2020 as a result of upgrades to the existing joint UP/BNSF rail line. In addition, the proposed DM&E rail line, now a division of the Canadian Pacific Corporation, is assumed to be constructed between 2025 and 2030. Completion of the new rail line would add up to an additional 100 mmtpy of take-away capacity from the Wyoming PRB by 2030.

The development and production parameters outlined above provided the basis for the economic modeling for this analysis.

2.2 Economic Modeling and Analytical Methods

From the assumptions presented in Section 2.1, which were developed primarily from a resource policy and engineering perspective, a set of economic inputs was derived as a starting point for the Wyoming PRB regional cumulative impact analysis that used specific data and models to project future conditions in socioeconomic terms.

The regional socioeconomic cumulative impact analysis for this study started with the mathematical modeling of the total effect of change to the regional economy. Economic change starts with the “infusion” or inflow of new monies from non-local sources into the study area through spending on new development and locally produced goods and services, including natural and energy resources such as those represented in the RFD scenarios. Economic change occurs as new money is spent and re-spent within the local economy. The mathematical model simulates the economic transactions that would occur and calculates the resulting total effect. General concepts like jobs and income are used to measure the impacts, along with estimates of many additional specific economic outcomes.

2.2.1 REMI Model

The regional model used in this study is Regional Economic Models, Inc. (REMI) Policy Insight. REMI is a fully developed forecasting model that projects how changes in a local economy cause economic effects on an annual basis. The REMI model for this study was customized to represent two economic regions, one encompassing only Campbell County, and the other comprising of the seven Wyoming counties bordering Campbell County and linked to its economy by established industry and consumer trading and workforce commuting patterns. Results for the second region then were analyzed to focus on the five counties (Converse, Crook, Johnson, Sheridan, and Weston) that are the most directly linked to development influences in the PRB. For purposes of this report, the second region is referred to as the five-county area or surrounding counties.

An important feature of REMI is its capability to model how local population is involved in the economy and how it changes in response to new economic opportunities. This component of the model explicitly addresses the key issues identified in Section 2.1 regarding local labor markets and their response to change, the role of migration in future growth, the spillover of energy development effects from

Campbell County to neighboring counties, the adequacy of community infrastructure and services to meet projected needs, and the fiscal effects of future development on affected units of local government and public schools.

2.2.2 Economic Inputs to REMI

REMI is sensitive to a wide range of economic activities, and its software interface facilitates “what if” analysis. An important step in the technical approach to this regional analysis is the translation of activities defined in the Task 2 report of the PRB Coal Review (AECOM 2011) into economic terms for input into REMI as two different scenarios that can be compared and contrasted.

The “what if” framework for the analysis involves two steps: 1) the lower production scenario for RFD activities was derived by translating assumptions regarding the number of new wells, tons of coal, and cubic feet of gas into a series of changes to future jobs and industry sales in each of the affected industries directly involved in the activity; and 2) the upper production scenario was derived by translating a similar series meant to add in the changes to future jobs and industry sales that would occur if the economy were to experience activity levels under the upper production scenario instead of the lower production scenario. Changes in annual production and the value of power generated were the basis for estimating future operating employment for utilities.

In each step, industries that were modeled in REMI were selected to represent the activities assumed by the RFD scenarios. These industries included mineral production industries (i.e., mining industry for coal, conventional oil and gas, and CBNG) and the contractors and professionals who support all types of mining; the construction industry for direct investment in new power plants and railroad lines; utilities for the operations of new power plants; and transportation for the operations of new railroad lines. Each series was a set of annual numbers from 2010 through 2030.

Based on the specified inputs, REMI calculates the total effect on the economy and population, the distribution of effects between Campbell County and its neighbors, the timing of any highs and lows in overall development, flows of economic migration and commuting between the two model regions, and changes to the demographics of the population by age.

The forecasts and their implications are discussed in Chapter 3.0. These include details selected to provide planning insight and for use in estimating other variables not directly modeled in REMI. For example, REMI directly models population change by age. Change specific to the school aged population of 5 to 17 years of age is directly relevant to considering impacts to the public schools, while change to the population aged 65 years or older is relevant to a range of interests specific to retirees and the elderly. However, in two cases, detailed results that are goals of this study were not modeled directly by REMI. The first is the employment and population effects of the upper and lower production scenarios in each of the five individual counties in the surrounding counties region. The second is the demand for housing in each county in the study area. The approach to deriving these effects from REMI results is described in the following sections.

2.2.3 Economic and Demographic Projections

A number of considerations led to the use of the two-region REMI model for the PRB Coal Review. Since a principal goal of the study is to estimate employment and population for individual counties throughout the study area, it was necessary to undertake additional analysis and forecasting to disaggregate REMIs surrounding counties’ forecasts. Separate spreadsheet models were used to divide REMIs aggregated forecasts (the control totals) into a separate forecast for each of the surrounding counties.

Regional Population by County and Community

The Wyoming Department of Administration and Information (WDAI) and the U.S. Census Bureau provided the principal data input for the disaggregation of total county population into total community

population. Wyoming historical data on county and community population were assembled, and the community shares were projected for each county. Shares for 2015, 2020, 2025, and 2030 were used to allocate the estimated total county populations. Initial results were compared to employment data assumptions in the RFD scenarios, and small ad hoc adjustments were made in selected communities for consistency with those assumptions.

County-level Population by Age

WDAI and the U.S. Census Bureau provided the principal data input for the disaggregation of county population by age (WDAI 2012; U.S. Census Bureau 2011). Wyoming historical data were grouped as five age groups within each county and matched by age group to REMI control totals for the upper and the lower production scenarios. County shares of each age group were projected for each county, and the projected shares for 2015, 2020, 2025, and 2030 were used to allocate the REMI control totals. Initial results were compared to employment data assumptions and to the disaggregated employment projections. Small ad hoc adjustments were made to the results in selected counties for both RFD scenarios to enhance consistency with employment assumptions.

2.2.4 Housing Requirements

The procedure used to forecast total housing requirements in the future principally was driven by projected population levels and long-term national and local trends toward smaller household sizes. Projected housing requirements also factored in allowances for vacancy rates associated with the normal functioning real estate market.

The trends affecting household size are expected to continue. However, population growth and immigration may offset such declines under localized conditions. This may occur in Campbell, Sheridan, and Johnson counties. Thus, some ad hoc adjustments were made to the initial projections to reflect the demographic impact of younger economic migrants drawn by the job opportunities represented in the RFD scenarios. The adjustments marginally raised the number of persons per household and lowered housing requirements from trend-projected levels.

Data on household formation and housing vacancy rates for each county in the study area were obtained from historical decennial censuses and local survey data. Housing requirements were derived from relationships among projected population, household size, the “normal” vacancy rate (3.5 percent) in the study area, and the number of units typically held as “vacant” for seasonal, recreational, occasional, or other temporary uses.

2.2.5 Fiscal Analysis

Determining the fiscal impact of current and future energy production in the PRB involved several steps. The methodology is summarized below and results are presented in Chapter 3.0. The methodology discussion is divided into two elements. The first is projected production, in terms of quantity (cubic feet, tons, or barrels, as appropriate) and monetary value. The second part discusses the approach to estimating the fiscal consequences associated with that production.

2.2.5.1 Production Quantity and Value

Due to differences in data sources, approach, and potential impacts, the production calculations were conducted differently for each of three energy commodities: coal, CBNG, and conventional oil and gas. Furthermore, there are subcategories within each commodity.

Coal

Coal production was addressed as a range, with figures for lower and upper production levels given in 5-year intervals based on the work completed for the Task 2 report (AECOM 2011). In the fiscal analysis,

the figures were interpolated into annual totals and were allocated to each affected county and school district based on the location of specific mines.

Production value was calculated by multiplying the production tonnage by a value per ton using the 2012 price adopted by the State of Wyoming's Consensus Revenue Estimating Group (CREG) (CREG 2012), which was then held constant through 2017, with a 1.0 percent annual increase thereafter. CREG is the official group charged with estimating mineral revenues to be received by the Wyoming State Government. Formed by agreement between the executive and legislative branches, CREG consists of representatives from state agencies, commissions, and the University of Wyoming. Semi-annually, CREG produces projections of major revenue streams for the upcoming 5 years. The projections consider anticipated levels of mineral production, valuation, earnings on investments, and general fund sources of revenue (e.g., sales tax receipts) and are used to help guide state budgeting. The projections generally are released in January and October.

CBNG

CBNG production was calculated separately for existing wells in 2011 and those drilled in 2012 and beyond. Total production was disaggregated between federal, state, and private (fee) mineral interests, and also by county.

For future new wells, the calculation started with the number of wells to be drilled each year, as projected in the work completed for the Task 2 report (AECOM 2011). The fiscal analysis assigned annual production levels to each new well based on a lifetime production expectation of 234 million cubic feet (MMcf) and a production profile wherein annual production rises rapidly, peaks in the second year, and declines thereafter until the well becomes uneconomical and is capped.

For existing wells, the number of wells and their aggregate production were decreased over time in a similar manner but recognizing that, for the most part, the existing wells already had passed their most productive first 3 or 4 years.

Future prices were taken from CREG (2012); however, unlike coal, there was no escalation in the unit price of CBNG beyond 2014. In calculating the total production value, an adjustment was made to the unit price to reflect a credit available to the producer to offset the cost of production (assumed to be $0.50 per MMcf).

Conventional Oil and Gas

Future production of oil and gas from conventional (non-CBNG) wells was projected for the Wyoming PRB in the work completed for the Task 2 report (AECOM 2011). In the fiscal analysis, the production was allocated to the various counties and each leasehold type (federal, state, or fee) based on a constant factor that was, in turn, based on the known 2010 production and the projected location of future facilities.

The unit pricing for natural gas (per MMcf) and oil (per barrel) were taken from CREG (2012) with an adjustment for the production cost credit for natural gas.

2.2.5.2 Development-related Public Sector Revenue Effects

Most of the fiscal consequences of RFD activities stem directly from the value of production in the various sources described above. The fiscal consequences on public sector revenues addressed in this analysis include:

- Federal mineral royalties (FMR);
- Severance taxes;
- State mineral royalties;

- Ad valorem taxes; and
- Federal coal lease bonus bids.

The fiscal analysis projects each of these on a year-by-year basis using the applicable geographic location of the production activity. Note that there also would be royalty or lease payments to the fee holders where the production involves privately held mineral rights; however, those have not been calculated, nor are they a part of the public fiscal benefit. Severance tax and ad valorem taxes accrue on production from all three forms of ownership.

Federal Mineral Royalties

Lessees pay a royalty to the federal government based on the value of the production taken from federal lands. The current royalty rate is 12.5 percent for coal and natural gas and 6.0 percent for oil. The total receipts, less a processing and administration fee, are split between the state and federal governments, yielding a net allocation of 49 percent to the state and 51 percent to the federal treasury. Funds disbursed to the State of Wyoming are distributed according to a legislatively approved allocation. A summary of the distribution allocation is presented in **Figure 2-5**.

Severance Taxes

Severance taxes are collected by the state on all mineral extraction based on the total production value. The current rate is 7.0 percent for coal and 6.0 percent for oil and natural gas. The state distributes the funds according to a formula to various entities, primarily the General Fund, the Budget Reserve, and the Permanent Wyoming Mineral Trust Fund. A certain amount of the total, up to a cap, goes to other entities, including local jurisdictions. At present, that cap is being met by existing statewide production, although a substantial portion comes from production in the PRB.

State Mineral Royalties

Production from state-owned lands is assessed a royalty of 16.67 percent of the production value. All of this royalty revenue accrues to the Wyoming Office of State Lands.

Ad Valorem Taxes

Ad valorem taxes are assessed by local jurisdictions based on a combination of the assessed value of taxable property and the local mill levy. In Wyoming, the total production value of extracted minerals is considered taxable property in the year it is extracted (collected the following year, as with other ad valorem taxes). In the case of coal and natural gas, an additional taxable amount has been added to account for the buildings and equipment associated with the production activity.

The fiscal analysis has calculated the potential ad valorem tax revenue for each county in the study area based on its current mill levy. It should be noted that assessments and mill levies change each year, and a large increase in production could result in a reduction in the mill levy, offsetting some or all of the potential increase in the total amount of taxes collected. In either case, it is a benefit to the taxpayers in that jurisdiction.

Federal Coal and Oil and Gas Lease Bonus Bids

Coal producers interested in securing rights to produce from federal coal resources must submit competitive bids to secure such reserves. To be accepted by the BLM, a winning bid must meet or exceed a minimum established by the agency that represents the estimated fair market value of the resource, allowing for future mine development and production costs and a reasonable profit. One half of the successful bonus bid amounts is returned to the state, with payments due within 5 years of the sale. Uncertainty exists with respect to the timing and size of future leases, although leasing of between 8 and 12 billion tons by 2030 is reasonably foreseeable. Bonus bids have been rising over time, with recent bids in the $0.71 to $1.35 per ton range. Future bonus bids could be anticipated to be within that range.

Federal lease bonuses also are generated on oil and gas leases and also are subject to uncertainties with respect to timing and amount.

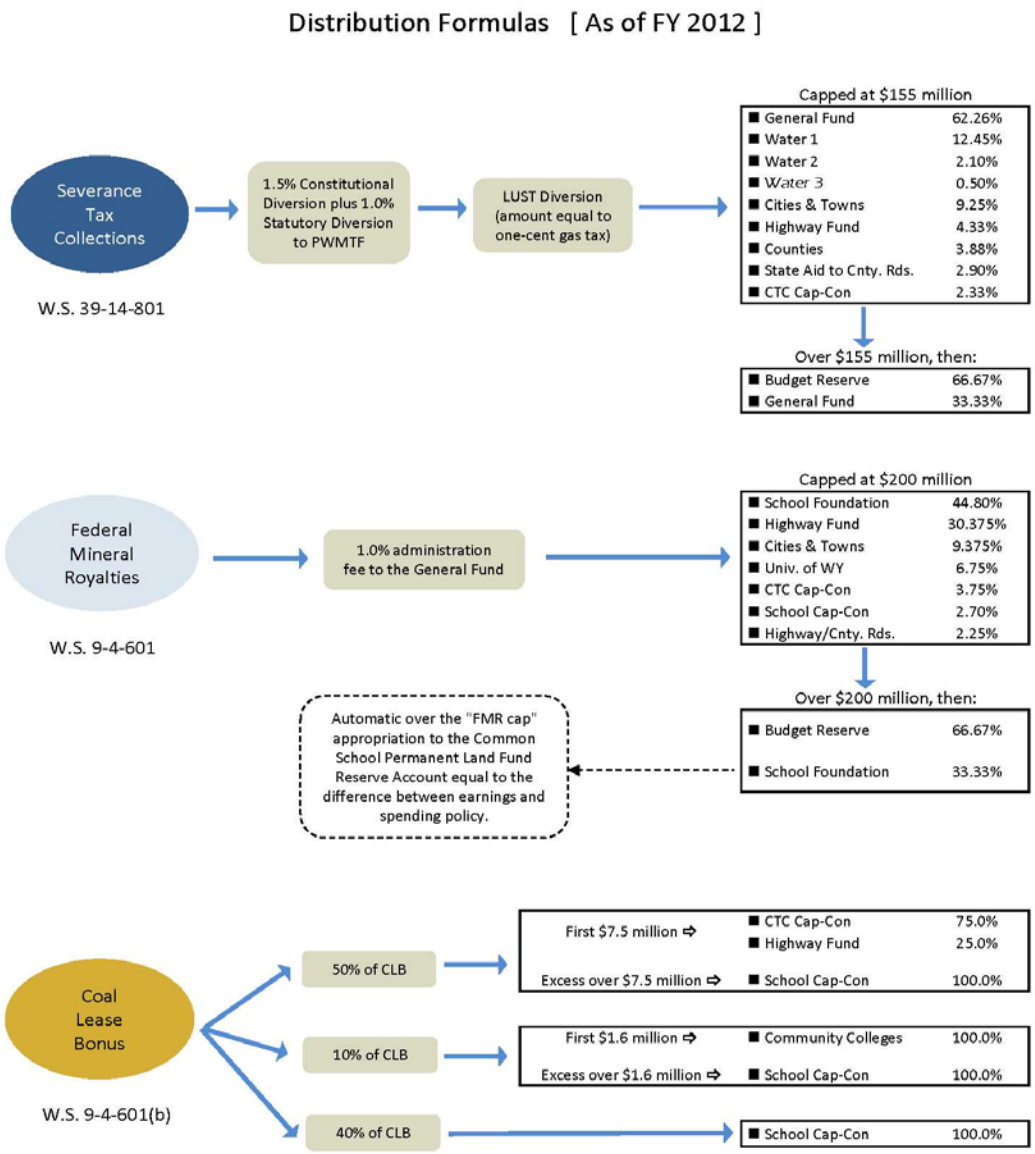


Figure 2-5 Distribution Formulas for State Revenues Derived from Energy Mineral Production

3.0 Cumulative Social and Economic Effects

The cumulative development scenarios discussed in the Task 2 report (AECOM 2011) and summarized in Chapter 2.0 of this report define an extended period of sustained energy development in the PRB study area. Employment in the economic sectors that drive the regional economy is expected to increase in response to the anticipated levels of future development activity and production. In the short-term, expanding labor demand can result in tight labor markets, characterized by competition for available labor, shortages of available and qualified labor, and higher wages, some of which has occurred in the PRB study area. Secondary employment gains in the trades, services, and other local industries associated with increased business and consumer spending may exacerbate the situation. Over time, such conditions may prompt migration, population growth, and a wide range of associated socioeconomic changes and effects, or constrain the pace of economic development activity.

This report describes the anticipated future effects of the cumulative development scenarios on the following key dimensions of the socioeconomic environment:

- Employment and personal income;
- Population;
- Housing;
- Public education;
- Facilities and services;
- Mineral-related public sector revenue effects; and
- Community and social effects.

The assessment of potential future cumulative impacts as presented below maintains a macro-level perspective on anticipated changes, focusing on indicators of change over time at the county level and reporting projected levels of key indicators. For purposes of this Task 3C report, conditions as of year-end 2010 are the base or benchmark for the analysis, and 2020 and 2030 are the milestone years for projected cumulative effects.

The discussion and presentation of results for each key dimension of the socioeconomic environment begins with a general overview and conclusion of the projected effects under the lower production scenario, with an emphasis on changes in Campbell County and Gillette. That emphasis reflects both the fact that much of the development activity is and would be located in Campbell County, and that Gillette serves as the employment, trade, and service center for a large share of that activity. The assessment initially addresses anticipated cumulative effects at a regional scale over the entire time horizon of this analysis (through 2030). The assessment then narrows to examine the cumulative effects at a more localized level, as well as highlighting timing issues in terms of how the changes would occur over time with respect to the milestone years (2020 and 2030) and the intervening periods they define. Anticipated cumulative effects associated with the upper production scenario are presented in a parallel fashion.

3.1 Employment and Personal Income

3.1.1 Lower Production Scenario

Total employment of 76,369 was reported in the six-county study area in 2010. Another 54,489 jobs were based in Natrona and Niobrara counties. That same year, total employment in Campbell County, where most of the coal mining and oil and gas related jobs were located, was 32,824 (U.S. Bureau of Economic Analysis 2012).

Total employment in the six-county study area under the lower production scenario is projected to increase by 5,864 jobs, to 82,233 by 2020. Most of the projected gains would occur outside of Campbell County, largely in Converse and Sheridan counties. Crook and Weston counties would experience modest long-term increases in employment. The added economic stimulus associated with RFD activities in the PRB also may result in job gains in nearby areas beyond the surrounding counties, primarily in response to the indirect and induced effects of energy industry demands and higher consumer income. Those effects are not addressed in this study.

Under the lower production scenario, the pace of employment growth in Campbell County between 2010 and 2020 would be slower than in the recent past. Moderation in the pace of increases in coal mine employment as a result of productivity gains (e.g., new technologies, larger equipment, etc.) and the projected pace of future CBNG development largely account for the relative slowdown.

Another 4,380 new jobs are projected between 2020 and 2030, to 86,613 by 2030. Approximately 34 percent of the total increase between 2010 and 2030 (3,505 additional jobs) would be based in Campbell County, the majority of which (3,038 jobs) would occur between 2020 and 2030. In contrast to the projected job gains from 2010 to 2020 that would be more concentrated in the surrounding counties, the majority of the projected gains during this period would be in Campbell County. The key forces shaping the economic outlook during this period include a projected increase in coal mine employment, an anticipated increase in CBNG development, and completion of a coal-fired power plant. The gains in coal mine employment would be tempered somewhat by productivity gains.

The projected employment gains over the entire analysis period (through 2030) translates to an overall 0.6 percent compounded annual growth rate (CAGR) across the six-county study area. Among the individual counties, the growth rate in employment is projected to range from 0.4 percent CAGR in Weston County to 0.9 percent for Crook and Converse counties, with a 0.5 percent CAGR in Campbell County (**Table 3-1**).

Table 3-1 Total Employment by County under the Lower Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	32,824	33,291	36,329	467	3,505	0.5
Converse	8,297	9,472	9,898	1,175	1,601	0.9
Crook	4,261	4,895	5,057	634	796	0.9
Johnson	5,937	6,780	7,117	843	1,180	0.9
Sheridan	19,815	22,102	22,533	2,287	2,718	0.6
Weston	5,235	5,693	5,679	458	444	0.4
Six-county Study Area	76,369	82,233	86,613	5,864	10,244	0.6

[1] Source: U.S. Bureau of Economic Analysis 2012.

Anticipated increases in coal mine employment within the six-county study area, coupled with the associated secondary impacts from other industries, would account for approximately 22 percent of the total cumulative employment change through 2030. Another driving force behind projected growth, particularly in the surrounding counties, is the underlying growth projected in other sectors, including

health and education, accommodations and food service, and professional services, that reflect local manifestations of larger-scale national trends.

The growth in employment, particularly in Campbell County, would outpace the capacity of the resident labor force to satisfy the projected demand. The imbalance likely would result in labor force and population migration into the region. The net level of commuting to Campbell County by workers who reside in the surrounding counties and elsewhere also is projected to increase over time.

The 2010 Census data show that a substantial portion of the jobs in Campbell County are filled by residents of adjacent counties and elsewhere in Wyoming, as well as neighboring states (**Table 3-2**). In 2010, an estimated 3,535 jobs in Campbell County were filled by such commuters. The level of net commuting into Campbell County has increased over time, particularly during periods of rapid growth (**Figure 3-1**).

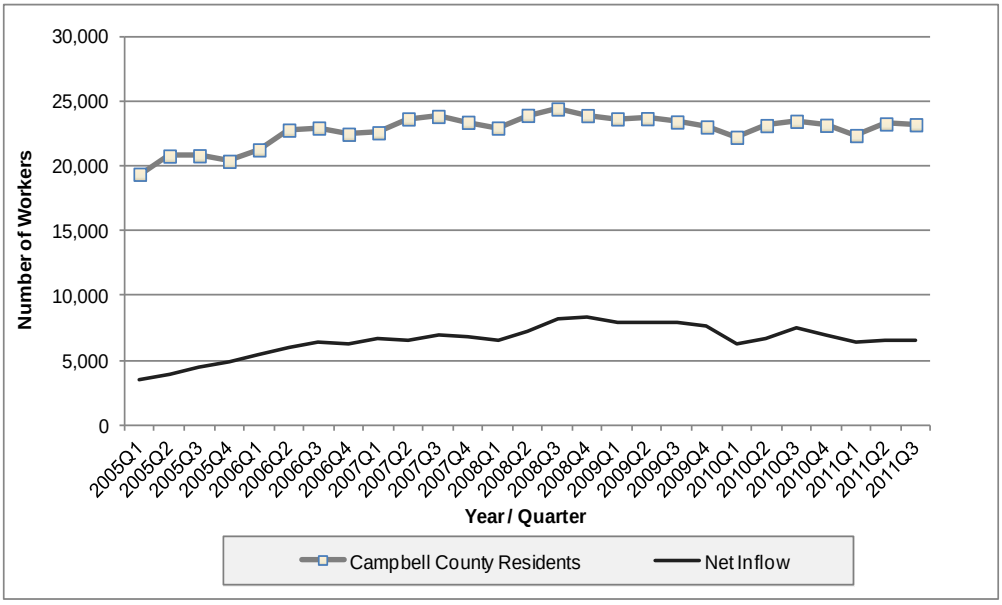
Table 3-2 Estimated Workforce Commuting in the Six-county Study Area (2010)

County	Local Jobs Filled by Residents	Local Jobs Filled by Nonresidents (inflow)	Local Residents Working Elsewhere (outflow)	Net Flow	Share of Local Jobs Filled by Residents (percent)
Campbell	19,257	7,672	4,137	3,535	71.5
Converse	3,263	1,428	2,736	-1,308	69.6
Crook	1,340	733	1,538	-805	64.6
Johnson	2,351	601	1,313	-712	79.6
Sheridan	9,555	2,359	3,473	-1,114	80.2
Weston	1,560	556	1,590	-1,034	73.7
Six-county Study Area	37,326	13,349	14,787	-1,438	73.7

Source: U.S. Census Bureau 2012.

The increase of commuters into Campbell County would have a corollary effect on the levels of outbound commuting projected from the surrounding counties and from Natrona County. Moreover, the commuting data suggest that substantial cross-commuting also occurs between counties in the surrounding region, such as between Converse and Natrona counties and between counties in the study area and locations outside the study area. An example of the latter would be residents of Sheridan employed at the coal mines in southern Montana.

Another implication of future increases in the net level of commuting into Campbell County would be increases in the net outflow of wage and salary earnings from Campbell County to the surrounding counties. Such flows of earnings and the consumer expenditures they produce support additional employment in the surrounding counties. Under the lower production scenario, the net annual outflow from Campbell County is projected to increase by approximately $240 million (2010 dollars) by 2030 relative to the 2010 base of $212 million. The increases in net outflows are the combined result of increases in the level of commuting and increases in average real wages and salaries, particularly in energy-related industries.



Source: Wyoming Department of Workforce Services 2012.

Figure 3-1 Source of Labor for Jobs in Campbell County

The economic expansion associated with the lower production scenario would stimulate growth in personal income across the study area, both in aggregate and on a per capita basis. In 2010, total personal income was $2.12 billion in Campbell County and $3.00 billion in the surrounding counties. Under the lower production scenario, total personal income in Campbell County is projected to increase by almost 160 percent to $5.47 billion (2010 dollars) in 2030. Total personal income in the surrounding counties is projected to increase by 149 percent to $7.47 billion in 2030. The gains in total personal income would be reflected in rising real per capita personal incomes across the region. In Campbell County, real per capita income is projected to climb steadily over time, with a net increase of approximately 25 percent by 2030. The average gain in the surrounding region is projected to be higher, approximately 40 percent.

The apparent anomaly of per capita income being higher in the surrounding counties than in Campbell County reflects the combined effects of larger average household sizes in Campbell County (i.e., more children), the net inflows of labor income from Campbell County to the surrounding counties, and the continued influence of higher-than-average non-labor income in Sheridan and Natrona counties on the overall average. The latter is a residual impact of the structure of the REMI model, which included Natrona and Niobrara counties in the second region even though they are not included in the six-county study area.

3.1.2 Upper Production Scenario

Total employment in the six-county study area is projected to increase by 7,051 jobs, to 83,240 in 2020 under the upper production scenario (**Table 3-3**). The difference in employment, relative to the lower production scenario, would be 1,187 jobs, or approximately 1.4 percent in total employment above that under the lower production scenario. Substantially higher annual coal production would contribute to the additional growth, although the gains in mining employment would be tempered by anticipated gains in annual output per employee. Those gains presumably would be a result of substantial added capital investments by the mining companies. Virtually all of the incremental gains projected for the upper

production scenario, relative to the projected gains under the lower production scenario, would be in Campbell County.

An additional 5,675 jobs are projected in the six-county study area from 2020 to 2030 under the upper production scenario (**Table 3-3**). Nearly 75 percent of those gains would be in Campbell County. Continued growth in coal mining in Campbell and Sheridan counties, the construction and operation of another coal-fired power plant, and an increase in coal exports via rail and the associated expansion of the rail system, would be the driving forces behind the gains. Net gains of nearly 2,800 jobs in Sheridan County, 1,658 jobs in Converse County, and more than 1,200 jobs in Johnson County also are projected under the upper production scenario. The projected employment gains over the entire analysis period translate to a 0.8 percent CAGR in Campbell County and across the region as a whole.

Table 3-3 Total Employment by County under the Upper Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	32,824	34,381	38,582	1,557	5,758	0.8
Converse	8,297	9,491	9,955	1,194	1,658	0.9
Crook	4,261	4,905	5,086	644	825	0.9
Johnson	5,937	6,793	7,158	856	1,221	0.9
Sheridan	19,815	22,145	22,615	2,330	2,800	0.7
Weston	5,235	5,705	5,699	470	464	0.4
Six-county Study Area	76,369	83,420	89,095	7,051	12,726	0.8

[1] Source: U.S. Bureau of Economic Analysis 2012.

Local labor market conditions associated with the upper production scenario would foster higher levels of workforce commuting into Campbell County than under the lower production scenario, particularly from 2020 to 2030. The increase in workforce commuting under the upper production scenario would result in an additional $36 million in net annual outflow of labor earning from Campbell County by 2030.

The incremental economic expansion associated with the upper production scenario would stimulate additional personal income growth across the study area, both in aggregate and on a per capita basis. Total personal income in Campbell County is projected to increase to $5.78 billion (2010 dollars) in 2030, $310 million higher than under the lower production scenario. Total personal income in the surrounding counties is projected to increase $7.53 billion in 2030, 0.8 percent higher than under the lower production scenario.

3.2 Population

3.2.1 Lower Production Scenario

The economic expansion associated with cumulative development under the lower production scenario would stimulate substantial population growth in the study area, arresting or stabilizing recent trends of declining population. Total population growth of 22,300 residents between 2010 and 2030 is projected across the six-county study area, a CAGR of 0.9 percent (**Table 3-4**).

Table 3-4 Projected Population by County under the Lower Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	46,133	55,602	58,621	9,469	12,488	1.2
Converse	13,833	16,219	16,670	2,386	2,837	0.9
Crook	7,082	8,159	8,471	1,077	1,389	0.9
Johnson	8,569	9,526	9,955	957	1,386	0.8
Sheridan	29,119	32,202	32,696	3,083	3,577	0.6
Weston	7,206	8,012	7,829	806	623	0.4
Six-county Study Area	111,942	129,720	134,242	17,778	22,300	0.9

[1] Source: U.S. Census Bureau 2011.

Just over half of the net population growth in the study area through 2020 is projected to occur in Campbell County, with the addition of 9,469 net new residents, raising the county's total population to 55,602 (**Figure 3-2**). The pace of growth would moderate between 2020 and 2030, with a projected net gain of 4,522 residents. Such growth equates to a CAGR of 1.2 percent, compared to a 0.9 percent CAGR for the overall study area. Sheridan, Johnson, Converse, and Crook counties also would experience substantial gains in population over the time horizon of this analysis. Population gains in Weston County would be smaller due the smaller labor force available to meet future demand and the longer commuting distances between the local communities in Weston County and the mines and other large employers in Campbell County. Although not part of the six-county study area, Natrona County also would realize long-term population growth, both as an indirect consequence of the development activity in the PRB and its role as a trade and services center for much of the state.

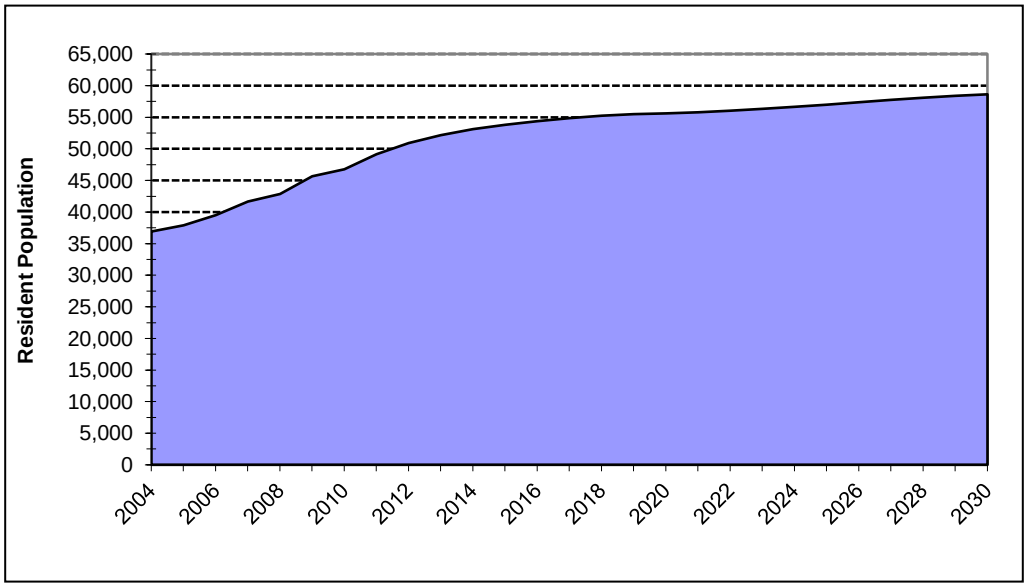


Figure 3-2 Campbell County Population under the Lower Production Scenario

Resident labor is expected to satisfy much, but not all, of the expanded labor demand associated with the lower production scenario. Consequently, labor force shortages would trigger more labor force immigration to meet the strong demand for workers, which would result in a proportional increase in commuting.

As is presently the case, it is projected that the majority of the population growth would be concentrated in Gillette, Sheridan, Douglas, and Buffalo (**Table 3-5**). Smaller towns such as Newcastle, Wright, and Sundance that serve as local employment, trade, and service centers also would see gains. Collectively, these communities are projected to gain 14,418 residents between 2010 and 2030, a 20 percent increase compared to 2010 and comparable in absolute terms to that which occurred between 2000 and 2010. However, given that the current projections cover a 20-year analysis horizon, the current outlook represents a substantial moderation in population growth as compared to the past decade.

Of the communities in the region, Gillette would experience the largest population gains with nearly 7,900 additional residents. When compared to the 2010 census population of 20,494, the growth would represent a 27 percent increase and a continuation of the strong growth that has characterized the past three decades. Although smaller in magnitude, the projected population growth of approximately 4,600 residents in the unincorporated areas near Gillette, Wright, and other parts of the Campbell County also would experience strong growth with attendant pressures on public services.

The growth implications of the lower production scenario for Gillette may be more pronounced than suggested by the projections outlined above. Long-term monitoring of the local housing stock and vacancy rates by the city suggest many dwelling units in the community are occupied on an extended basis by individuals or groups of unrelated individuals who consider their primary place of residence to be elsewhere. By U.S. Census Bureau definitions, those individuals, although they spend considerable time in the community and impose demands on public services while simultaneously supporting local retail and service establishments and generating tax revenues, are not classified as residents, and the dwelling units they inhabit are considered vacant. The projections presented in **Table 3-5** are consistent with the U.S. Census Bureau definition. However, from the city's perspective, these individuals are more like residents than, for example, motorists traveling along the Interstate-90 corridor who overnight in Gillette. The city has developed the concept of a Gillette Service Population to characterize the situation and estimates its effective population is as much as 2,800 higher than estimates reported by the U.S. Census Bureau. The number of temporary residents increases in response to oil and gas development and construction of major new facilities. The pace of energy development presently is below recent levels; however, it is expected to increase again between 2020 and 2030. Assuming that occurs and temporary populations correspondingly increase in the future, the city's effective service population would increase to approximately 40,000 by 2030.

3.2.2 Upper Production Scenario

With added economic stimulus under the upper production scenario, the total population in the six-county study area is projected to reach 131,040 by 2020 (**Table 3-6**), resulting in an incremental population growth of 1,320 residents in the six-county study area by 2020 relative to the projected population under the lower production scenario. Of that total, Campbell County would gain an additional 1,042 residents, with Converse and Sheridan counties gaining approximately 60 and 120 residents, respectively. The remaining counties in the PRB also would register modest additional population gains relative to the lower production scenario.

By 2030, the total population in the six-county study area is projected to reach 137,831 (**Table 3-6**). The net gain of 25,889 residents would represent a CAGR of 1.0 percent, slightly above the 0.9 percent CAGR under the lower production scenario. The impetus for the additional growth under the upper production scenario would include increases in mining employment over time, construction of a new power plant, and increases in rail shipment of coal. Realization of the upper production scenario would imply a 33 percent increase (approximately 157 mmtpy) in total annual coal production in 2030 relative to

Table 3-5 Projected Population for Counties and Selected Communities under the Lower Production Scenario

County/Community	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030
Campbell County					
Gillette	29,087	35,057	36,961	5,970	7,874
Wright	1,807	2,178	2,296	371	489
Rest of County	15,239	18,367	19,364	3,128	4,125
Total	**46,133**	**55,602**	**58,621**	**9,469**	**12,488**
Converse County					
Douglas	6,120	7,176	7,375	1,056	1,255
Glenrock	2,576	3,020	3,104	444	528
Rest of County	5,137	6,023	6,191	886	1,054
Total	**13,833**	**16,219**	**16,670**	**2,386**	**2,837**
Crook County					
Moorcroft	1,009	1,162	1,207	153	198
Sundance	4,019	4,630	4,807	611	788
Rest of County	2,055	2,367	2,458	312	403
Total	**7,083**	**8,159**	**8,472**	**1,076**	**1,389**
Johnson County					
Buffalo	4,585	5,097	5,327	512	742
Rest of County	3,984	4,429	4,628	445	644
Total	**8,569**	**9,526**	**9,955**	**957**	**1,386**
Sheridan County					
Sheridan	17,444	19,293	19,589	1,849	2,145
Rest of County	11,672	12,909	13,107	1,237	1,435
Total	**29,116**	**32,202**	**32,696**	**3,086**	**3,580**
Weston County					
Newcastle	3,532	3,926	3,836	394	304
Upton	1,100	1,223	1,195	123	95
Rest of County	2,576	2,863	2,798	287	222
Total	**7,208**	**8,012**	**7,829**	**804**	**621**
Six-county Study Area					
Selected Places	71,279	82,762	85,697	11,483	14,418
Rest of Area	40,663	46,958	48,546	6,295	7,882
Total	**111,942**	**129,720**	**134,243**	**17,778**	**22,301**

[1] Source: U.S. Census Bureau 2011.

Table 3-6 Projected Population by County under the Upper Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030	CAGR 2010 to 2030 (percent)
Campbell	46,133	56,644	61,557	10,511	15,424	1.5
Converse	13,833	16,282	16,817	2,449	2,984	1.0
Crook	7,082	8,189	8,544	1,107	1,462	0.9
Johnson	8,569	9,561	10,040	992	1,471	0.8
Sheridan	29,119	32,322	32,976	3,203	3,857	0.6
Weston	7,206	8,042	7,897	836	691	0.5
Six-county Study Area	111,942	131,040	137,831	19,098	25,889	1.0

[1] Source: U.S. Census Bureau 2011.

the lower production scenario. Projected gains in employee productivity would temper the increases in employment needed to achieve the projected production levels (AECOM 2011). As a result, the differences in projected population under the lower and upper production scenarios would climb from 1,320 in 2020 to 3,589 in 2030 (**Table 3-7**).

Table 3-7 Differences in Projected Population by County, Lower versus Upper Production Scenarios

County	2020	2030
Campbell	1,042	2,936
Converse	63	147
Crook	30	73
Johnson	35	85
Sheridan	120	280
Weston	30	68
Six-county Study Area	1,320	3,589

Of the 3,589 incremental increase in residents under the upper production scenario for 2030, Campbell County would gain approximately 2,940 additional residents, with Converse and Sheridan counties gaining approximately 150 and 280 residents, respectively (**Table 3-7**). The remaining counties in the study area also would register modest additional population gains relative to the lower production scenario.

At the local level, population changes affecting communities under the upper production scenario would mirror those outlined under the lower production scenario, with the majority of the gains occurring in Gillette, Sheridan, Douglas, and Buffalo (**Tables 3-5** and **3-8**). Gillette would be anticipated to gain nearly 9,800 residents between 2010 and 2030 under the upper production scenario, climbing to 38,812, approximately 1,850 higher than under the lower production scenario. Including allowances for persons who work and live in the community on a long-term basis, but who consider the primary residence to be

Table 3-8 Projected Population for Counties and Selected Communities under the Upper Production Scenario

County/Community	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030
Campbell County					
Gillette	29,087	35,588	38,812	6,501	9,725
Wright	1,807	2,211	2,411	404	604
Rest of County	15,239	18,645	20,334	3,406	5,095
Total	**46,133**	**56,444**	**61,557**	**10,311**	**15,424**
Converse County					
Douglas	6,120	7,203	7,440	1,083	1,320
Glenrock	2,576	3,032	3,132	456	556
Rest of County	5,137	6,046	6,245	909	1,108
Total	**13,833**	**16,281**	**16,817**	**2,448**	**2,984**
Crook County					
Moorcroft	1,009	1,167	1,217	158	208
Sundance	4,019	4,647	4,848	628	829
Rest of County	2,055	2,376	2,479	321	424
Total	**7,083**	**8,190**	**8,544**	**1,107**	**1,461**
Johnson County					
Buffalo	4,585	5,116	5,372	531	787
Rest of County	3,984	4,445	4,668	461	684
Total	**8,569**	**9,561**	**10,040**	**992**	**1,471**
Sheridan County					
Sheridan	17,444	19,365	19,757	1,921	2,313
Rest of County	11,672	12,957	13,219	1,285	1,547
Total	**29,116**	**32,322**	**32,976**	**3,206**	**3,860**
Weston County					
Newcastle	3,532	3,941	3,870	409	338
Upton	1,100	1,227	1,205	127	105
Rest of County	2,576	2,874	2,822	298	246
Total	**7,208**	**8,042**	**7,897**	**834**	**689**
Six-county Study Area					
Selected Places	71,279	83,497	88,064	12,218	16,785
Rest of Area	40,663	47,343	49,767	6,680	9,104
Total	**111,942**	**130,840**	**137,831**	**18,898**	**25,889**

[1] Source: U.S. Census Bureau 2011.

elsewhere, the estimated Gillette Service Area population could exceed 41,000. The Gillette area also would experience additional population growth in the nearby unincorporated portions of the county. Incremental gains of more than 100 residents above the corresponding forecasts for the lower production scenario also would occur in Wright and the communities and unincorporated areas of Converse and Sheridan counties by 2030.

3.3 Housing

Effects of the RFD scenarios on regional housing demand would link population change to social conditions in the communities in the study area that potentially would be affected by the cumulative development. The private sector generally produces housing when presented with new market opportunities. However, when housing demand is created by short-term projects or by sustained rapid growth, supply may not expand sufficiently in quantity or in the appropriate time frame to match a community's housing needs.

Both RFD scenarios would substantially increase the demand for housing in the six-county study area. In terms of new housing requirements (a measure that assumes that the housing supply grows in response to a rising number of households but would not shrink when households decrease), the lower production scenario would require approximately 8,400 additional housing units through 2030, an approximate 16 percent growth over 2010 levels. This follows the more rapid increase of 9,775 units that occurred in the study area between 2000 and 2010. The total new housing requirements under the upper production scenario would be approximately 9,800 additional housing units, 19 percent above the 2010 total supply and approximately 1,400 additional units than under the lower production scenario. Approximately 50 percent of the projected demand for new housing under either RFD scenario would occur in Campbell County. The forecasted rate of growth under the upper production scenario, and to a slightly lesser extent under the lower production scenario, would be large enough to exert pressure on housing markets and the housing development and construction industries at a time when demands for labor and other resources already would be high.

3.3.1 Lower Production Scenario

The projected housing requirements under the lower production scenario are provided in **Tables 3-9** and **3-10**. More than two-thirds of the new housing potentially required in Campbell County under the lower production scenario would be needed by 2020. Housing needs in the other counties of the six-county study area also would see strong demand through 2020, with the pace of demand for new housing moderating between 2020 and 2030. The projected housing needs for the six-county study area through 2030 include demands for more than 1,800 additional units in Sheridan County and approximately 1,200 units in Converse County. Weston County would experience an increase in housing demand from 2010 to 2020; however, demand is expected to drop by 2030.

Table 3-9 Total Housing Requirements under the Lower Production Scenario

County	2010[1]	2020	2030	Additional Need 2010 to 2030
Campbell	18,955	21,899	23,056	4,101
Converse	6,403	7,419	7,609	1,206
Crook	3,595	3,936	4,068	473
Johnson	4,553	4,742	4,934	381
Sheridan	13,939	15,560	15,783	1,844
Weston	3,533	3,926	3,845	393[2]
Six-county Study Area	50,978	57,482	59,295	8,398

[1] Source: U.S. Census Bureau 2011.

[2] Value reflects higher need in 2020 as shown in **Table 3-10**.

Table 3-10 Net New Housing Requirements under the Lower Production Scenario

County	2010 to 2020	2020 to 2030	Net Total
Campbell	2,944	1,157	4,101
Converse	1,016	190	1,206
Crook	341	132	473
Johnson	189	192	381
Sheridan	1,621	223	1,844
Weston	393	---[1]	393
Six-county Study Area	6,504	1,894	8,398

[1] Need in 2030 is projected to be lower than need in 2020.

3.3.2 Upper Production Scenario

Tables 3-11 and **3-12** provide the projected total and incremental new housing requirements in the study area under the upper production scenario. Housing requirements would reflect increased mining in Campbell and Converse counties, construction of an additional power plant, and increased rail shipments affecting the southeast portion of the six-county study area. Based on the timing of the development activities and the related production level, a somewhat higher number of new housing units would be needed in Campbell and Converse counties from 2020 to 2030 than would be needed from 2010 to 2020.

Under the upper production scenario, an incremental increase of 400 housing units would be required in Campbell County through 2020 relative to the lower production scenario, with an incremental increase of 700 housing units from 2020 through 2030. However, the net increase in required housing units from 2020 to 2030 (1,884) would be less than 60 percent of that required during the 2010 to 2020 period (3,343). Although more development and related housing demand is projected to occur in Campbell County, strong housing demand also would occur in Converse and Sheridan counties. Weston County would experience a strong increase in housing demand from 2010 to 2020; however, demand is expected to drop by 2030.

Table 3-11 Total Housing Requirements under the Upper Production Scenario

County	2010[1]	2020	2030	Additional Need 2010 to 2030
Campbell	18,955	22,298	24,182	5,227
Converse	6,403	7,446	7,671	1,268
Crook	3,595	3,948	4,098	503
Johnson	4,553	4,757	4,973	420
Sheridan	13,939	15,614	15,908	1,969
Weston	3,533	3,940	3,875	407[2]
Six-county Study Area	50,978	58,003	60,707	9,794

[1] Source: U.S. Census Bureau 2011.

[2] Value reflects higher need in 2020 as shown in **Table 3-12**.

Table 3-12 Net New Housing Required under the Upper Production Scenario

County	2010 to 2020	2020 to 2030	Net Total
Campbell	3,343	1,884	5,227
Converse	1,043	225	1,268
Crook	353	150	503
Johnson	204	216	420
Sheridan	1,675	294	1,969
Weston	407	---[1]	407
Six-county Study Area	7,025	2,769	9,794

[1] Need in 2030 is projected to be lower than need in 2020.

3.4 Public Education

Communities across the six-county study area would experience increased total population as a result of economic migration; however, the effects on the sizes of the school-age populations would vary by location. In some counties, the size of that group (ages 5 to 17 years) may even trend in the opposite direction of the total population trend. As the age structure of the population changes, school districts in the study area would be among the public service providers most affected. The demographic forecasts developed from the RFD scenarios project increases in school-age populations over time which would translate to increases in public school enrollments across much of the study area. However, unlike overall population, which is projected to continue to climb between 2020 and 2030, school age population is projected to peak and then decline between 2020 and 2030.

The projected changes in school enrollment across the six-county study area likely would be accommodated within the normal operation of the state's system for funding operations and construction of school facilities. The Wyoming School Foundation Program (WSFP) provides a guaranteed level of funding to every school district. When enrollment grows, the WSFP provisions generally ensure adequate funding for operations; however, the WSFP practice of funding on a 3-year moving average can cause gaps when unanticipated rapid growth occurs in a short period (e.g., 1 or 2 years). School districts are eligible for additional funding when they experience rapid growth of more than 10 percent above the previous year.

Appropriations for extraordinary facility needs in the public schools historically have been funded from the state's budget reserve account, which in turn receives revenue from the mineral severance tax, mineral royalties, and coal lease bonus distributions. Additionally, under Wyoming School Facilities Commission (WSFC) planning guidelines, minor capacity shortages generally are accommodated through temporary facilities, such as portable classrooms.

3.4.1 Lower Production Scenario

From 2010 to 2020, annual growth in projected school enrollments under the lower projection scenario would range from 1.2 percent to 2.2 percent CAGR. Projected change from 2020 to 2030 would range from -0.6 percent (Campbell) and 0.2 percent (Converse). Projected school-age populations under the lower production scenario, by county, are presented in **Tables 3-13** and **3-14** and shown in **Figures 3-3** and **3-4**.

Table 3-13 School-age Population (ages 5 through 17) under the Lower Production Scenario

County	2010[1]	2020	2030	Net Change 2010 to 2020	Net Change 2010 to 2030
Campbell	8,977	11,163	10,468	2,186	1,491
Converse	2,518	2,830	2,884	312	366
Crook	1,177	1,414	1,375	237	198
Johnson	1,303	1,584	1,537	281	234
Sheridan	4,635	5,351	5,222	716	587
Weston	1,146	1,302	1,245	156	99
Six-county Study Area	19,756	23,644	22,731	3,888	2,975

[1] Source: Wyoming Department of Education 2012.

Table 3-14 Campbell County School-age Population by Grade Group under the Lower Production Scenario

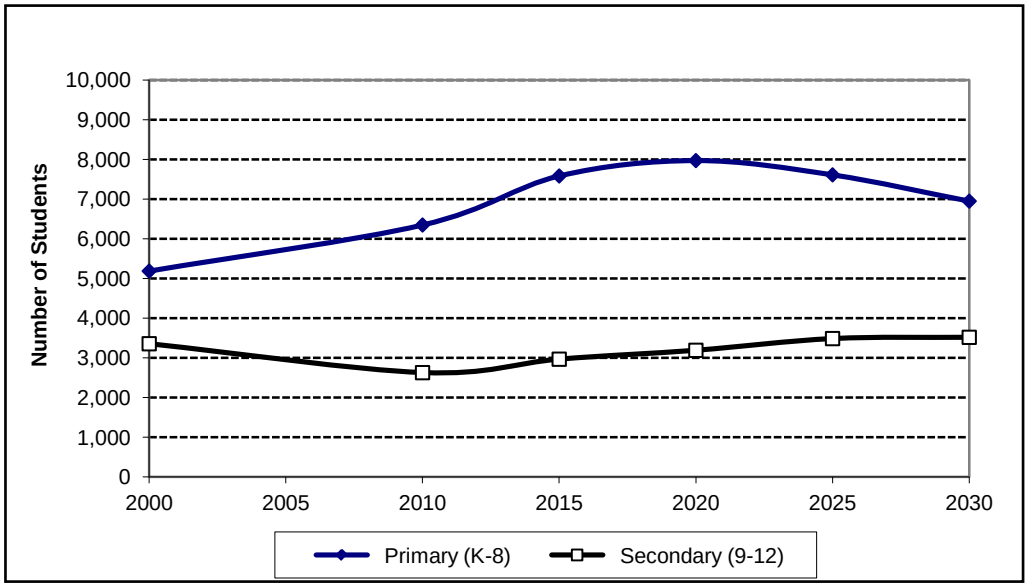
School Grades	2010[1]	2020	2030	Net Change 2010 to 2020	Net Change 2010 to 2030
Primary/Middle (K-8)	6,348	7,971	6,949	1,623	601
Secondary (9-12)	2,629	3,192	3,519	563	890

[1] Source: Wyoming Department of Education 2012.

Under the lower production scenario, Campbell County would experience a substantial increase in school-age children through 2020 (an added 2,189 children, or approximately 24 percent). The increase in school-age children in Campbell County would be concentrated in the lower grades (K-8) through 2020. Beyond 2020, secondary enrollments would increase as the school-age population matures and moves through the system. The increases in elementary enrollment in Campbell County would likely trigger a need for elementary school, and possibly middle-school, construction. Beyond 2020, the need for capacity would shift to the high schools, although the overall change may not support construction of another school.

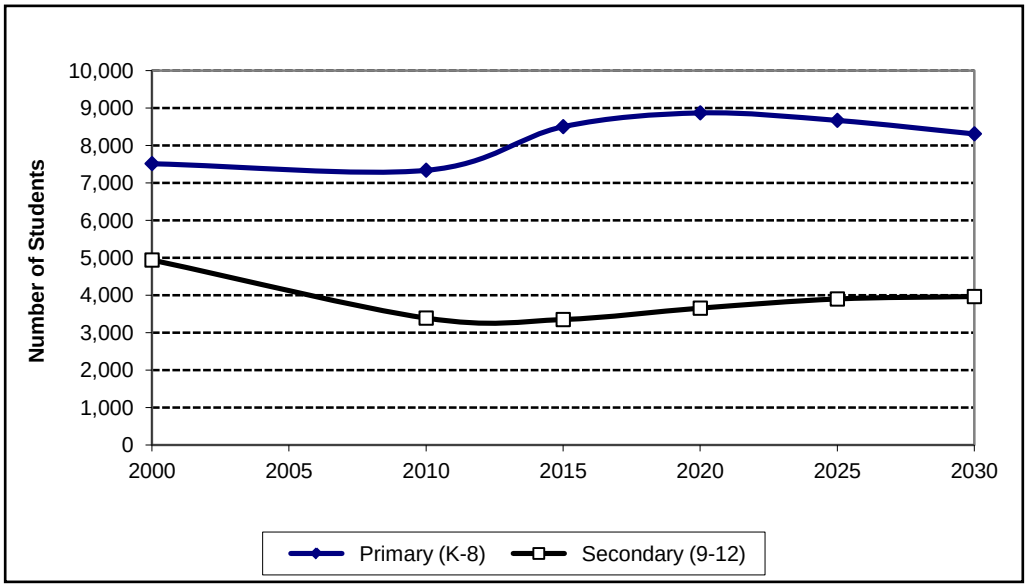
School districts serving the other counties in the six-county study area, particularly those serving the Sheridan and Douglas communities, also would likely experience substantial increases in school enrollments between 2010 and 2020, followed by declining enrollments through 2030. The net changes in projected school enrollment from 2010 through 2030, by county, are:

- Campbell County – approximately 1,490 additional (up 17 percent);
- Converse County – approximately 365 additional (up 15 percent);
- Crook County – approximately 200 additional (up 17 percent);
- Johnson County – approximately 235 additional (up 18 percent);
- Sheridan County – approximately 590 additional (up 13 percent); and
- Weston County – approximately 100 additional (up 9 percent).



Source: Wyoming Department of Education 2012.

Figure 3-3 School Enrollment in Campbell County School District #1 under the Lower Production Scenario



Source: Wyoming Department of Education 2012.

Figure 3-4 School Enrollment in the Surrounding Counties under the Lower Production Scenario

In those school districts where enrollment growth would occur under the lower production scenario, the response under WSFC planning guidelines generally would be to accommodate minor capacity shortages through temporary facilities, such as portable classrooms. For larger long-term increases, the WSFC policy is to fund capital expansion where warranted by projections developed during annual updates of each school districts' facility needs plans. Based on the projections for the lower production scenario, the need for additional facilities could arise in Sheridan County.

3.4.2 Upper Production Scenario

The projections of school-age population under the upper production scenario are presented in **Tables 3-15** and **3-16**. Total enrollment would peak around 2020, similar to the anticipated pattern under the lower production scenario. However, the projected declines in enrollment after 2020 would be smaller than those under the lower production scenario as the higher population growth would help offset the natural decreases in school-age population as children age and move through the system.

Table 3-15 School-age Population (ages 5 through 17) under the Upper Production Scenario

County	2010[1]	2020	2030	Change 2010 to 2020	Change 2010 to 2030
Campbell	8,977	11,360	11,102	2,383	2,125
Converse	2,518	2,842	2,916	324	398
Crook	1,177	1,420	1,391	243	214
Johnson	1,303	1,591	1,555	288	252
Sheridan	4,635	5,375	5,281	740	646
Weston	1,146	1,308	1,260	162	114
Six-county Study Area	19,756	23,896	23,505	4,140	3,749

[1] Source: Wyoming Department of Education 2012.

Table 3-16 Campbell County School-age Population by Grade Group under the Upper Production Scenario

School Grades	2010[1]	2020	2030	Net Change 2010 to 2020	Net Change 2010 to 2030
Primary/Middle (K-8)	6,348	8,120	7,420	1,772	1,072
Secondary (9-12)	2,629	3,240	3,682	611	1,053

[1] Source: Wyoming Department of Education 2012.

The upper production scenario would result in substantial growth in the school-age population in Campbell County through 2020. The projected increase of 2,383 students represents an approximately 27 percent increase over the 2010 enrollment, 9 percent higher than potentially would occur under the lower production scenario. The added growth under the upper production scenario would place more pressure on the district's facilities and likely would result in the need for additional facility construction. As under the lower production scenario, the bulk of the increase initially would be felt in the elementary grades but would shift toward the secondary schools over time as the students mature and advance through the system. The net change in the number of students grades K-8 would rise by approximately 1,070 (17 percent) between 2010 and 2030, with a net increase of approximately 1,050 secondary students (40 percent) during the same period.

RFD activities under the upper production scenario also would raise the level of enrollment growth in the other five counties in the study area. School-age enrollment growth in Sheridan County would reach 740 students by 2020, possibly triggering the need for additional facility construction. Depending on the age/grade distribution of district enrollments, some of the other districts also could face capacity constraints. For those school districts in the other five counties in the study area where net enrollment growth would occur, the response under WSFC planning guidelines generally would be to accommodate minor capacity shortages through temporary facilities, such as portable classrooms, and to fund capital expansion where warranted by projections developed during the annual updates of school districts' 5-year plans.

Between 2010 and 2030, total school enrollments under the upper development scenario would climb in all counties in the study area. Projected net changes in the public school enrollments during this period based on the 5- to 17-year-old population and incremental changes relative to the lower production scenario include:

- Campbell County – approximately 2,125 additional students (up 24 percent) and 634 more students than under the lower production scenario;
- Converse County – approximately 400 additional students (up 16 percent) and 32 more students than under the lower production scenario;
- Crook County – approximately 215 additional students (up 18 percent) and 16 more students than under the lower production scenario;
- Johnson County – approximately 250 additional (up 19 percent) and 18 more students than under the lower production scenario;
- Sheridan County – approximately 650 additional (up 14 percent) and 59 more students than under the lower production scenario; and
- Weston County – approximately 115 additional students (up 10 percent) and 15 more students than under the lower production scenario.

3.5 Facilities and Services

This section discusses potential demand for selected local government facilities and services associated with cumulative energy-related employment and population growth as presented in Sections 3.1 and 3.2, respectively, of this report.

As noted in the Task 1C report (AECOM 2012), local government facilities and services not only reflect demand, but also reflect revenue availability and community values regarding appropriate services and service levels. Although energy development typically affects all services provided by local governments, this report focuses on law enforcement at the county level, which is one of the services most immediately affected by energy development, as well as water supply and wastewater systems, two of the facilities and services, which along with schools (discussed in Section 3.4) can require substantial cost and long lead times to develop.

The 20-year time-span considered in this assessment complicates the projection of local government facility and service demand because service delivery systems and community standards for service delivery would undoubtedly evolve. However, the demand projections presented in this assessment provide a reasonable estimate of the demand for the key local government facilities and services that would be associated with the projected population growth as presented in Section 3.2.

Counties and some special districts that would experience increased service demand from energy development also would receive substantial revenues in the form of ad valorem property taxes on facilities and production and, for counties, sales and use taxes on the purchase of materials and supplies. On the other hand, municipalities typically receive little or no property taxes from energy

development, relying instead on sales and use tax revenues derived from consumer and business expenditures to fund operations and on other revenues and bonded indebtedness to fund expansion of facilities and services to meet energy-related demand. The residential and commercial growth that accompanies energy development also would generate some property tax revenue for municipalities.

Additionally, counties and municipalities affected by rapid energy development may need to expand facilities and services in advance of the receipt of substantial revenues from the energy development. Such lags in funding can exacerbate the challenges faced by service providers.

There are several mechanisms at the state level available to municipalities to help address these problems.

The Wyoming Joint Powers Act (Wyoming Statute [WS] 16-1-101), was enacted in 1973. The act allows counties, municipalities, and other government entities to cooperate in the development and operation of public facilities and in the provision of public services. In addition to the obvious advantages of consolidating services and sharing costs, the potential advantage for energy-impacted communities is that affected counties receive ad valorem tax revenues on industrial facilities and production, typically the greatest amount of energy-related revenue, while municipalities often receive the majority of the impact from energy-related population growth. The Joint Powers Act allows local officials to share resources to address revenue disparities, if they choose to do so. The Gillette Campbell County Joint Powers Board, created under cooperative agreement between the City of Gillette, Campbell County, and the Town of Wright to provide countywide fire protection, suppression, and emergency medical response, is an example of a cooperative service and taxing arrangement authorized under the Joint Powers Act.

Companies intending to construct coal mines and power plants with a construction cost over a threshold amount ($190.2 million in 2012) would be required to satisfy the provisions of the Wyoming Industrial Information and Siting Act (WIISA). The WIISA was intended to address the impacts of power plants, mines, and other large industrial projects; most oil and gas development, most pipelines, and large power lines are specifically exempt under WS 35-12-119. Under WIISA, the Industrial Siting Council, created under WS 35-12-104, holds public hearings and reviews the socioeconomic and environmental impacts of industrial facilities before issuing a permit for construction. A key local government benefit of WIISA is that counties and municipalities designated as affected by an industrial facility are eligible for Impact Assistance Payments (IAPs) under the provisions of WS 39-6-411(c) and 39-6-512(d). These payments are derived from incremental increases in state sales taxes in an affected county over a monthly average of sales tax receipts during the year preceding the initiation of construction of the facility, and if available, could help fund needed expansions of facilities and services. Affected counties and municipalities must be levying a 1-cent local option tax to be eligible for IAPs. Although not guaranteed (IAPs depend on the state of the general economy and other activities occurring in an affected county prior to and during construction), IAPs can provide substantial revenue for affected communities, which can be used for financing needed facilities and services to accommodate industrial growth.

In addition to the above sources of funding, the Wyoming State Land and Investment Board administers a number of loan and grant programs that may help local governments expand facilities to address energy development-related demand.

3.5.1 Lower Production Scenario

The population growth projected under the lower production scenario for the six-county study area, as presented in **Table 3-5**, would generate demand for additional local government staff and equipment as well as potential expansion of some facilities. Given the relative magnitude of projected growth as a percentage of the existing population, particularly between 2010 and 2020, many of the counties and communities would likely add staff incrementally over the 10 year period.

Population increases under the lower production scenario from 2010 through 2020 would range from just under 11 percent in Sheridan County to approximately 20 percent in Campbell County. Sheridan County's modest growth rate is a reflection of the larger population base compared to the other counties in the study area except Campbell County. The actual amount of growth during this period is the second highest in the six-county study area. During this period, Campbell County, Converse County (17 percent growth), and Crook County (15 percent) would be required to expand services and some public facilities to accommodate the anticipated growth. Counties and some special districts could receive energy development-related revenues to fund this expansion. Municipalities might need to secure financing or seek state assistance to fund expansion.

Anticipated growth from 2010 to 2020 would be more moderate for Sheridan, Johnson, and Weston counties (approximately 11 percent each) under the lower production scenario. Depending on the timing of the growth (i.e., incremental over the 10 year period rather than occurring over 1 or 2 years), these counties may be able to more readily accommodate the projected demand related to energy development.

During the second decade of the assessment period (2020 to 2030), energy development-related growth would moderate substantially under the lower production scenario, ranging from a high of a 5 percent increase over the 10-year period for Campbell County to a population loss of 2 percent for Weston County. Counties and communities would face fewer challenges in accommodating facility and service demand during this period.

Although Campbell County has the highest projected growth rate in the six-county study area, the projected growth rates under the lower production scenario would be within the range of projected population levels addressed in the comprehensive plans for Campbell County and the City of Gillette. The City of Gillette is developing facilities to accommodate this level of growth, such as the Gillette Regional Water Supply project. Additionally, Campbell County and the City of Gillette have formed Joint Powers authorities to administer key facilities and services that could help channel funds from development to expansions that would accommodate development-related demand.

3.5.1.1 Law Enforcement

Population growth typically generates staff and equipment demands for law enforcement and emergency response agencies, although the nature of that workforce (e.g., construction) or industrial activities associated with that workforce (e.g., high traffic levels) could generate demand for higher service levels or special service responses.

Based on current ratios of law enforcement officers to population in the respective jurisdictions (AECOM 2012), the projected population levels presented in **Table 3-5** would generate the need for the following additional law enforcement in each county in the study area under the lower production scenario:

- Campbell County and the City of Gillette (the Campbell County Sheriff's Office provides law enforcement services to the Town of Wright) would need approximately 20 additional law enforcement officers by 2020. As many as six additional officers could be needed by 2030.
- Converse County and the municipalities of Douglas and Glenrock would need an additional five law enforcement officers by 2020. Demand for one additional officer would be generated by 2030.
- Crook County and the municipalities of Moorcroft, Sundance, and Hulett would need an additional four law enforcement officers by 2020. This is a relatively high number because these local governments have a combined officer-to-population ratio of 4.3 officers per 1,000 population (Wyoming Attorney General 2012). One additional officer would be needed by 2030.

- Johnson County and the City of Buffalo would need two additional law enforcement officers by 2020 and one additional officer by 2030.
- Sheridan County and its municipalities would need five additional law enforcement officers by 2020 and one additional officer by 2030.
- Weston County and its communities would need two additional law enforcement officers by 2020. That level of demand would remain constant through 2030 because the County is forecast to have a slight population loss during that decade under the lower production scenario.

3.5.1.2 Other Services

The population levels associated with the lower production scenario also would generate demand for additional emergency response (fire and ambulance) personnel. In many jurisdictions, these would be for volunteer firefighters and emergency medical technicians. In the case of counties that would host energy development, demand for emergency response personnel and equipment would occur not only in municipalities, but also at energy development sites and along transportation routes to those sites. Emergency response agencies often have difficulty recruiting and retaining staff and volunteers during times of large-scale energy development.

Water and wastewater systems in municipalities in the six-county study area would be adequate to accommodate the population growth associated with the lower production scenario, with the exception that the Gillette wastewater treatment system would reach capacity by 2020.

Population growth associated with the lower production scenario would likely cause demand for additional health care services throughout the six-county study area. The Campbell County Hospital in Gillette could be required to expand its facilities and staff to accommodate the increased demand.

Depending on the type of energy development and its location within a particular county, impacts on county roads and highway safety could result in higher demands for county road maintenance and traffic management. This is typically the case with CBNG and conventional oil and gas development, but access roads to mines and power plants also could be affected. Road damage agreements between counties and energy companies often have been used to help counties defray these costs.

3.5.2 Upper Production Scenario

The projected increases in population from 2010 to 2020 under the upper production scenario range from approximately 11 percent in Sheridan County to approximately 23 percent in Campbell County. This would be approximately 0 to 2 percent higher, respectively, than under the lower production scenario. Growth rates for Converse County (18 percent), Crook County (16 percent), Johnson County (12 percent) and Weston County (12 percent) would be essentially the same as under the lower production scenario during the 2010 to 2020 period.

Growth rates during the 2020 to 2030 period would be somewhat higher under the upper production scenario. Campbell County would grow approximately 9 percent during this period; Converse, Crook, and Johnson counties would grow approximately 3, 4, and 5 percent, respectively. Sheridan County would grow 2 percent (again, owing to its larger population base) during this period, and Weston County would lose approximately 2 percent of its population, essentially the same as under the lower production scenario.

In absolute numbers, the differences in population gain between the lower and upper production scenarios would be negligible over the 20-year period for all counties except Campbell County. Consequently, the differences in local government facilities and services demand under the upper production scenario would be similar to the demand associated with the lower production scenario.

Based on current ratios of law enforcement officers to population, the projected population levels presented in **Table 3-8** would generate demand for approximately 22 additional law enforcement officers by 2020 in Campbell County and the City of Gillette, 2 officers more than under the lower production scenario. An additional 11 officers would be needed by 2030. Demand for law enforcement officers in other counties would be similar to that associated with the lower production scenario.

The capacity of the Gillette wastewater treatment system would be exceeded in 2020 under the upper production scenario and the Gillette Regional Water Supply Project would likely reach its design capacity between 2020 and 2030. All other municipal water and wastewater systems should be able to accommodate the projected population growth under the upper production scenario.

3.6 Mineral-related Public Sector Revenue Effects

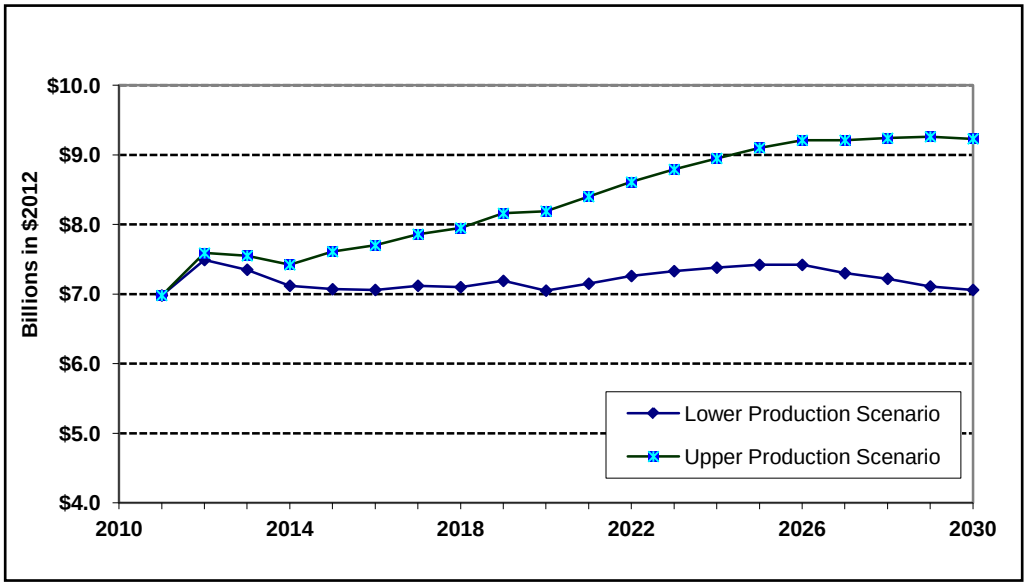
FMR and state and local taxes levied on coal and other mineral production are important sources of public revenue in Wyoming. Taxes, fees, and charges levied on real estate improvements, retail trade, and other economic activity supported by energy development provide additional sources of revenue to support public facilities and services. These revenues benefit not only the jurisdictions within which the production or activity occurs, but also the federal treasury, state coffers, school districts, and local governments across the state through various revenue-sharing and intergovernmental transfer mechanisms. This section examines the changes in some of the key revenue sources associated with the cumulative development activity under the lower and upper production scenarios. The projected changes primarily reflect changes in future production levels, as the prices for oil and gas, assessment basis, and tax rates are held constant at the current level over the entire analysis period (2010 to 2030). Coal prices also were held constant over time. Public expenditures by affected units of local government, school districts, and other special districts would increase over time in response to growing demand for services, changing regulations, and other factors. The current study does not project future expenditures due to the large number of affected entities and complexities associated with estimating expenditures over time.

At the foundation of the mineral development revenue projections are projected levels of future energy and mineral resource production (i.e., tons of coal mined and barrels of oil produced). In 2010, the total value of such production was estimated at $6.16 billion. Slightly more than 60 percent ($3.79 billion) represents the value of coal production (Wyoming Department of Revenue 2012). Projections of future coal production, summarized in Section 2.1 of this report, were developed for the Task 2 report (AECOM 2011). Projected conventional oil and gas and CBNG production was based on the projected number of new wells to be drilled and typical per well production profiles. Production of other minerals also contributes mineral development revenues; however, the values on other resources are relatively minor in comparison to coal, oil, and natural gas and are, consequently, not included in this analysis.

Under the lower production scenario, the aggregate value of annual mineral production is projected to remain relatively constant over time, fluctuating between $7.0 billion and $7.4 billion (**Figure 3-5**). This forecast reflects the combined effects of substantially lower natural gas production and lower natural gas prices. The combined value of coal, oil, and natural gas production under the upper production scenario, all of which represents the incremental value of higher coal production, would climb over time, peaking at approximately $9.3 billion in 2027. The incremental difference, as compared to the value under the lower production scenario, would be nearly $2.0 billion, all attributable to higher coal production.

As occurs presently, the overwhelming majority of the mineral production value is anticipated to be in Campbell County, with more than $6.1 billion in annual production over the analysis period. Based on the anticipated drilling rates for CBNG and shifts in coal recovery along the county boundaries in southern Campbell and northern Converse counties, the overall value of production in Converse and Johnson counties is projected to decline over time, while increasing in Sheridan County (**Table 3-17** and **Figure 3-6**).

Projected production values under the upper production scenario mirror the profiles shown in **Figure 3-5**, with more rapid growth beyond 2020. Most of the incremental value would accrue in Campbell County as most of the additional production would come from mines in the Gillette area. Expanded coal production would be responsible for approximately another $2.0 billion, raising the total annual value in Campbell County to approximately $8.1 billion in annual value by 2030 (**Table 3-17** and **Figure 3-7**).

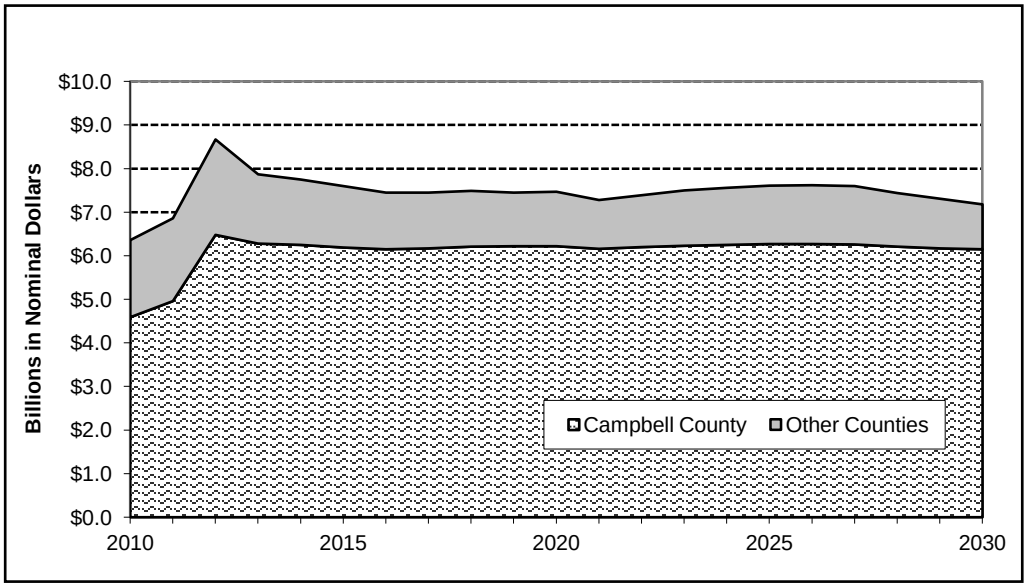


Source: AECOM 2011.

Figure 3-5 Projected Coal, Oil, and Natural Gas Production Value in the Wyoming PRB

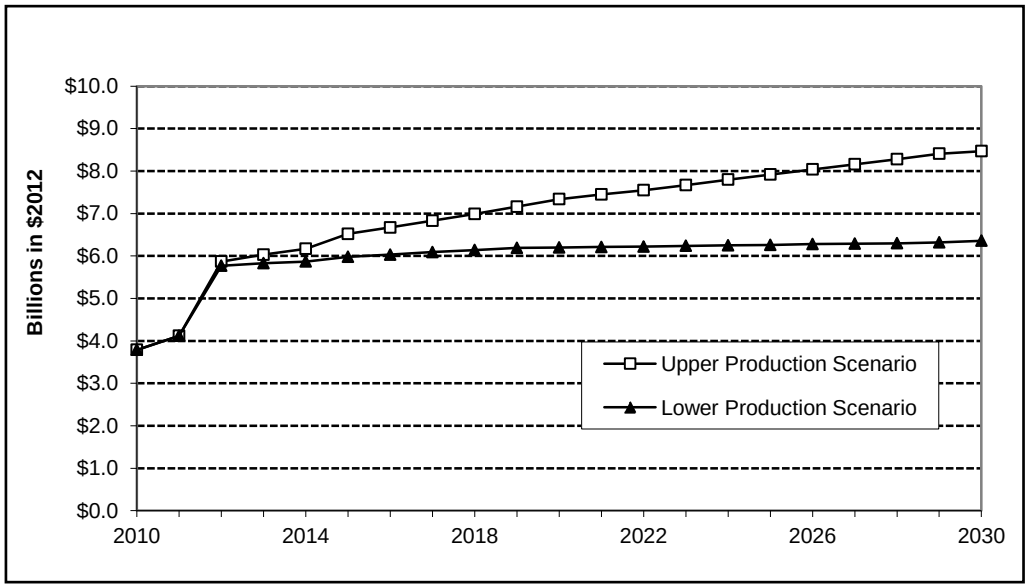
Table 3-17 Projected Value of Energy Resource Production in Selected PRB Counties (in 2012 dollars)

County	2020 Amount (million $)	2020 Share (percent)	2030 Amount (million $)	2030 Share (percent)
Lower Production				
Campbell	6,215.3	83.2	6,145.7	85.6
Converse	622.1	8.3	548.2	7.6
Johnson	410.9	5.5	270.9	3.8
Sheridan	220.4	3.0	213.6	3.0
Total	**7,468.7**	**100.0**	**7,178.4**	**100.0**
Upper Production				
Campbell	7,357.7	85.4	8,121.4	87.4
Converse	622.1	7.2	548.2	5.9
Johnson	410.9	4.8	270.9	2.9
Sheridan	220.4	2.6	348.0	3.8
Total	**8,611.1**	**100.0**	**9,288.5**	**100.0**



Source: Wyoming Department of Revenue 2012.

Figure 3-6 Energy Resource Production Value 2010 to 2030 under the Lower Production Scenario



Source: Wyoming Department of Revenue 2012.

Figure 3-7 Annual Value of Coal Production in the Wyoming PRB

An estimated 1,643 new conventional oil and gas wells are projected to be drilled in the Wyoming PRB through the end of the cumulative analysis period (by 2030). As a result of the slower pace of development and declining production from existing wells, production of oil and natural gas is projected to decline over the long term. Over time, the combined value of oil and gas would decrease by more than

75 percent, from $2.2 billion in 2010 to an estimated $0.5 billion in 2030. (Note: Oil value projections are based on a price of $85 per barrel.)

As a result of the above changes and as depicted in **Figure 3-8** for the lower production scenario, coal would account for approximately 88 percent of the total mineral production value in 2020, compared to 62 percent in 2010. The share of mineral production value attributable to CBNG would decrease from 29 to 7 percent, with conventional oil and gas accounting for less than 5 percent of the total value in 2020, compared to the current 9 percent. The shares of overall mineral development values derived from CBNG would increase temporarily between 2020 and 2030 due to a short-term increase in new well development projected in Task 2 (AECOM 2011). However, the trend in declining production and value would occur towards the end of the analysis period due to the sharp decline in annual production rates associated with CBNG wells.

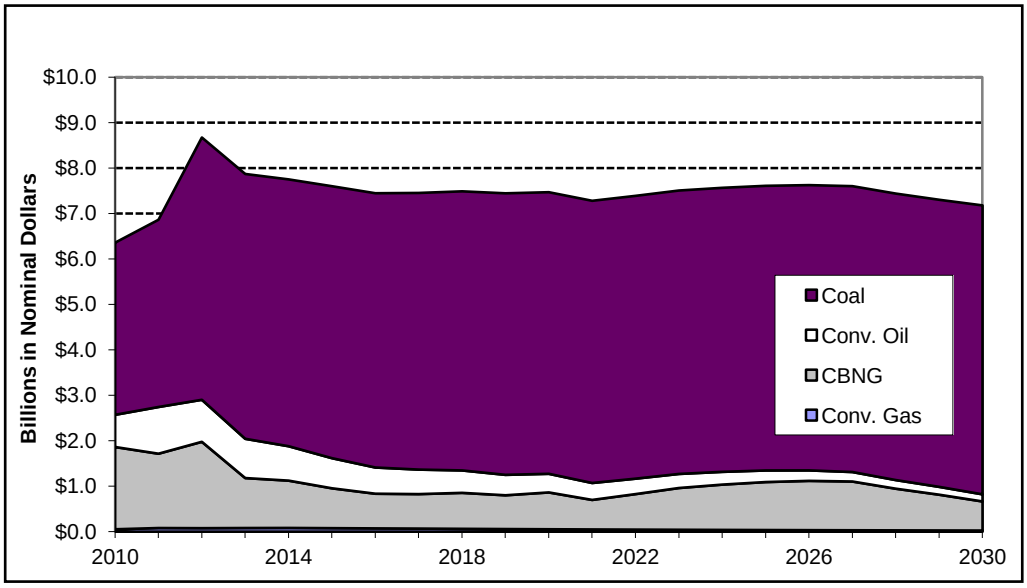


Figure 3-8 Value of Energy Resource Production to 2030 by Major Resource Type under the Lower Production Scenario

Under the upper production scenario, the share of total annual value from coal would increase to 90 percent of the total in 2020, and 94 percent in 2030.

Projected increases in the level and values of mineral production would have dramatic implications for future mineral development revenues. These revenues, which include federal and state mineral royalties, as well as state severance and local ad valorem taxes, would accrue to federal, state, and local governments. Future leasing of federal coal reserves would produce coal lease bonus bid revenues. Energy resource production also would generate substantial sales and use taxes, which would benefit state and local governments. However, future receipts of such tax revenues are not projected as part of this study due to the complexities associated with developing assumptions of the underlying relationships between development activity, the taxable elements and locations of those activities, locations of those activities or events, and tax receipts.

Between 2010 and 2030, total projected receipts derived from the five selected revenue sources are $38.1 and $43.7 billion, for the lower and upper production scenarios, respectively, exclusive of any coal lease bonus bids. Receipts derived from coal production would account for the majority of the totals under either scenario, with FMR representing the single largest revenue source, ranging from $14.6 to $17.2 billion (2012 dollars), for the lower and upper production scenarios, respectively (**Table 3-18**).

Table 3-18 Selected Tax Revenues Associated with Energy Resource Production in Campbell, Converse, Johnson, and Sheridan Counties (in 2012 dollars)

Resource/Taxes	2011-2015 (million $)	2016-2020 (million $)	2021-2025 (million $)	2026-2030 (million $)	Total (million $)
Coal – Lower Production Scenario					
Severance Tax	1,776.3	2,130.8	2,178.0	2,201.5	8,286.6
FMR	3,139.6	3,766.2	3,849.5	3,891.1	14,646.4
State Mineral Royalties	0.0	0.0	0.0	0.0	0.0
Ad Valorem Tax (counties)	359.8	466.1	480.2	485.0	1,791.1
Ad Valorem Tax (schools)	1,776.6	2,297.5	2,367.2	2,391.0	8,832.3
Subtotal	**7,052.3**	**8,660.6**	**8,874.9**	**8,968.6**	**33,556.4**
Coal – Upper Production Scenario					
Severance Tax	1,818.9	2,391.3	2,646.5	2,856.3	9,713.0
FMR	3,214.9	4,226.7	4,677.7	5,048.4	17,167.7
State Mineral Royalties	0.0	0.0	0.0	0.0	0.0
Ad Valorem Tax (counties)	364.3	511.5	571.1	615.9	2,062.8
Ad Valorem Tax (schools)	1,798.8	2,521.3	2,816.2	3,039.2	10,175.5
Subtotal	**7,196.9**	**9,650.8**	**10,711.5**	**11,559.8**	**39,119.0**
CBNG					
Severance Tax	245.0	151.1	194.7	158.4	749.2
FMR	337.4	200.1	250.5	203.7	991.7
State Mineral Royalties	55.5	32.4	40.0	32.6	160.5
Ad Valorem Tax (counties)	113.9	64.8	74.7	78.4	331.8
Ad Valorem Tax (schools)	299.2	152.1	154.3	163.6	769.2
Subtotal	**1,051.0**	**600.5**	**714.2**	**636.7**	**3,002.4**
Conventional Oil and Gas					
Severance Tax	277.8	166.8	106.0	66.1	616.7
FMR	147.8	91.1	58.5	37.0	334.4
State Mineral Royalties	68.1	40.4	25.2	15.4	149.1
Ad Valorem Tax (counties)	68.6	45.3	28.9	18.2	161.0
Ad Valorem Tax (schools)	121.5	79.9	50.6	31.6	283.6
Subtotal	**683.8**	**423.5**	**269.2**	**168.3**	**1,544.8**
Totals					
Lower Production	8,787.1	9,684.6	9,858.3	9,773.6	38,103.6
Upper Production	8,931.7	10,674.8	11,694.9	12,364.8	43,666.2

Including an administrative processing fee levied by the federal government, these revenues accrue to the Federal Treasury and the State of Wyoming on a 51 percent to 49 percent basis. The revenues returned to the state are distributed to multiple funds according to a legislatively established formula as discussed in Section 2.2.5 of this report.

The combined revenues on future coal production derived from property taxes and state severance taxes would exceed the FMR revenues, with $8.3 billion in state severance taxes and $10.6 billion in cumulative property tax revenues paid to local counties and school districts under the lower production scenario. The corresponding revenues under the upper production scenario are projected at $9.7 billion in state severance taxes and $12.2 billion in cumulative property tax revenues.

Projected revenues on future CBNG production total $3.0 billion between 2010 and 2030. FMR of $1.0 billion would account for the single largest share (33 percent) of the total, followed by ad valorem taxes of $769 million for public education (26 percent), and severance taxes for $749 million (25 percent). The state would receive a projected $161 million in mineral royalties on state mineral interests. Projected revenues from CBNG are the same under both RFD production scenarios.

Public sector tax and royalty revenues to be derived from conventional oil and gas production are estimated at $1.5 billion between 2010 and 2030. Severance taxes and FMR would account for the largest shares of those revenues, $617 million (40 percent) and $334 million (22 percent), respectively. Ad valorem taxes to support public education and county government are estimated at $445 million through 2030, with $149 million in state mineral royalties.

Campbell County would be the principal beneficiary of the higher property tax payments to local counties, with Converse, Sheridan, and Johnson counties also benefiting. School districts whose boundaries encompass the mineral production areas also would benefit from additional revenues. However, Campbell #1 would realize only part of the benefits due to the recapture provisions of the WSFP. Under those provisions, revenues generated locally that are in excess of certain limits are forwarded to the state for redistribution to other districts. It is anticipated that property taxes accruing to Campbell #1 would continue to exceed the limits, with the surplus revenues benefiting districts across the entire state.

Future development of energy and mineral resources in the PRB would generate other federal revenues beyond those outlined above and the sales and use tax revenues that are not analyzed in this analysis. Two of those revenue sources, payments in lieu of taxes (PILT) and coal lease bonus bids, portions of which are returned to the state or affected counties, are described below.

Payments in Lieu of Taxes

PILT is a federal program administered by the BLM that makes annual payments to local governments containing federal lands within their jurisdictional boundaries. In the PRB, a county's eligibility for PILT is based primarily on the acres of federal lands in the National Forest and National Park systems, and lands administered by the BLM (Section 6902). PILT payments are made to help offset the diminished property taxes receipts due to nontaxable federal lands within the local government boundaries. Eligibility for PILT is reserved for local governments (usually counties) that provide services related to public safety, environment, housing, social services, and transportation. PILT receipts may be used for any governmental purpose and are not required to be further distributed to other local government units, such as school districts or cities.

As provided for in the legislation, the BLM computes the eligible PILT payments authorized under Section 6902 using two alternative approaches, with the higher of the two amounts establishing the base entitlement. Payments are subject to a population ceiling limitation computed by multiplying the county population times a corresponding dollar value (adjusted annually for inflation). Actual PILT payments are affected by Congressional appropriations with any funding limitations resulting from such appropriations pro-rated equitably across all jurisdictions in the program.

In Fiscal Year 2011, PILT payments to counties in the PRB ranged from $474,914 for Weston County to $844,439 for Johnson County. PILT payments to Campbell County were $730,889. Among the study area counties, the population limitations only affect payments to Johnson County (U.S. Department of the Interior [USDOI] 2012).

Acreages of federal land ownership in the PRB are not expected to change substantially under the cumulative development scenarios, leaving the basic PILT entitlements and subsequent revenues unaffected for most counties. Over time, population increases in Johnson County would raise its population-related cap on PILT revenues. At the same time, continuation of and the level of funding for the PILT program is subject to Congressional reauthorization, At present (year-end 2012), the possibility exists that the program would not be reauthorized, at least in its current form, in the next session of Congress.

Coal Lease Bonus Bids

Coal producers are liable for FMR and state severance taxes on all production from federal coal reserves. In addition, operators must submit competitive bids to secure additional reserves. To be accepted by the BLM, the winning bid must meet or exceed a minimum established by the agency, with that minimum representing the estimated fair market value of the resource allowing for future mine development and production costs and a reasonable profit. One-half of the successful bid amounts are returned to the state, with payments due within 5 years of the sale even if the time required to mine the resources extends for a longer period. Coal lease bonus bids are tied to individual leasing actions, which occur periodically but not necessarily on a regular schedule. Consequently, the state's receipts of coal leases are used to fund the state's highway fund, school construction, community colleges, and other non-recurrent capital construction projects for cities, towns, counties, and special districts.

Future coal lease bonus bid revenues would be subject to the timing and size of future leasing actions. Current reserves in the Wyoming portion of the PRB are estimated at 6.8 billion tons. Based on the coal production projections developed for Task 2 (AECOM 2011), and allowing for a further 15 year reserve base at the end of 2030, future leasing of between 8.5 and 12.1 billion tons is foreseeable during the period covered in this assessment in order to maintain an adequate level of reserves for mine planning and operational purposes. Bonus bids have been rising over time, with recent bids in the in the range of $0.71 to $1.35 per ton (BLM 2012). Future bonus bids could be anticipated to be within that range, generating substantial revenues. As with the FMR, the coal lease bonus bids would be disbursed between the Federal Treasury and the State of Wyoming on a 51 percent to 49 percent basis.

3.6.1 Lower Production Scenario

The future production of coal would increase steadily over time, while the level of CBNG and conventional oil and gas production generally would decline. The net result of these two patterns is that the total annual value of mineral production declines under the lower production scenario, from $7.6 billion in 2015 to $7.2 billion in 2030. Over the entire cumulative analysis period (2010 through 2030), total production of these three resources would approach $150.6 billion (in 2012 dollars) (**Table 3-19**).

Table 3-19 Value of Mineral Production in the PRB under the Lower Production Scenario (in nominal dollars)

	2015 (million $)	2020 (million $)	2025 (million $)	2030 (million $)	Cumulative Total 2010-2030 (million $)
Value of Annual Mineral Production	7,600.4	7,468.7	7,609.5	7,178.4	150,552.2

Note: Includes coal, natural gas, and oil.

Mineral development revenues derived from production, excluding coal lease bonus bids and state and local sales and use taxes, are projected to total $38.1 billion. Of that total, approximately $8.1 billion initially would accrue to the Federal Treasury (51 percent of the FMR), and $30 billion would accrue to state and local coffers (**Table 3-20**). Under state revenue distribution formulas established by the Wyoming legislature, revenues collected by the state ultimately benefit the entire state.

Table 3-20 Summary of Mineral Development Tax Revenues Associated with Energy Resource Production under the Lower Production Scenario

	2011-2015 (million $)	2016-2020 (million $)	2021-2025 (million $)	2026-2030 (million $)	Total (million $)
By Resource					
Coal[1]	7,052.3	8,660.6	8,874.9	8,968.6	33,556.4
CBNG	1,051.0	600.5	714.2	636.7	3,002.4
Conventional Oil and Gas	683.8	423.5	269.2	168.3	1,544.8
Totals	**8,787.1**	**9,684.6**	**9,858.3**	**9,773.6**	**38,103.6**
By Revenue Source					
Severance Tax	2,299.1	2,448.7	2,478.7	2,426.0	9,652.5
FMR	3,624.8	4,057.4	4,158.5	4,131.8	15,972.5
State Mineral Royalties	123.6	72.8	65.2	48.0	309.6
Ad Valorem Tax (counties)	542.3	576.2	583.8	581.6	2,283.9
Ad Valorem Tax (schools)	2,197.3	2,529.5	2,572.1	2,586.2	9,885.1
Totals	**8,787.1**	**9,684.6**	**9,858.3**	**9,773.6**	**38,103.6**

[1] Coal-based revenues exclude coal lease bonus bids due to uncertainties regarding the amount and timing of coal leases and the bonus bids received.

3.6.2 Upper Production Scenario

The future production of coal, CBNG, and conventional oil and gas would climb steadily over time, exceeding $7.7 billion in 2010 and approaching $9.3 billion by 2030. The difference in production value between the lower and upper production scenarios in 2030 is nearly $2.0 billion annually, or 29 percent above the lower value. Over the entire cumulative analysis period, total production of these three resources would approach $172.3 billion (in nominal dollars) (**Table 3-21**), that difference would be entirely attributable to higher coal production.

Table 3-21 Value of Mineral Production in the PRB under the Upper Production Scenario (in nominal dollars)

	2015 (million $)	2020 (million $)	2025 (million $)	2030 (million $)	Cumulative Total 2010-2030 (million $)
Value of Annual Mineral Production	8,132.6	8,611.1	9,262.6	9,288.5	172,286.6

Note: Includes coal, natural gas and crude oil.

Mineral development revenues derived from that production, excluding coal lease bonus bids and state and local sales and use taxes, are projected to total $43.7 billion. Of that total, approximately $9.4 billion would accrue to the Federal Treasury (51 percent of the FMR); with $34.3 billion accruing to state and local coffers (**Table 3-22**). Under state revenue distribution formulas, the revenues collected by the state ultimately benefit the entire state.

Table 3-22 Mineral Development Tax and Royalty Revenues Associated with Energy Resource Production under the Upper Production Scenario

	2011-2015 (million $)	2016-2020 (million $)	2021-2025 (million $)	2026-2030 (million $)	Total (million $)
By Resource					
Coal[1]	7,196.9	9,650.8	10,711.5	11,559.8	39,119.0
CBNG	1,051.0	600.5	714.2	636.7	3,002.4
Conventional Oil and Gas	683.8	423.5	269.2	168.3	1,544.8
Totals	**8,931.7**	**10,674.8**	**11,694.9**	**12,364.8**	**43,666.2**
By Revenue Source					
Severance Tax	2,341.7	2,709.2	2,947.2	3,080.8	11,078.9
FMR	3,700.1	4,517.9	4,986.7	5,289.1	18,493.8
State Mineral Royalties	123.6	72.8	65.2	48.0	309.6
Ad Valorem Tax (counties)	546.8	621.6	674.7	712.5	2,555.6
Ad Valorem Tax (school)	2,219.5	2,753.3	3,021.1	3,234.4	11,228.3
Totals	**8,931.7**	**10,674.8**	**11,694.9**	**12,364.8**	**43,666.2**

[1] Coal-based revenues exclude coal lease bonus bids due to uncertainties regarding the amount and timing of coal leases and the bonus bids received.

3.7 Community and Social Effects

The BLM's goal of social assessment is to estimate the effects of an action on the well-being of people over the short and long term (Branch et al. 1982). Virtually any action has the potential to affect community social conditions. Social effects can be positive or adverse, major or minor, long-term or temporary. Examples of potential positive social effects associated with energy development include lower energy costs, higher standards of living associated with increased income, enhanced economic opportunities, expanded shopping alternatives, and improved community and health care services resulting from economic and population growth and increased tax revenues. Examples of potential adverse social effects associated with energy development include rapid population growth resulting in housing shortages; strained community facilities and services; increases in social problems such as crime, substance abuse, and domestic violence conflicts between new and existing populations and disruptions of community social fabric and ways of life. In many cases, an action can result in both positive and adverse social effects.

The 2010 through 2020 population forecasts associated with both RFD scenarios as described in Section 2.4 of this report would represent a continuation of the growth that occurred in Campbell, Crook, Johnson, and Sheridan counties during the 2000 through 2010 period, although at a somewhat slower pace. Converse and Weston counties would grow at a somewhat higher rate during the 2010 through 2020 period compared to the previous decade. Growth rates for all counties would diminish during the 2020 through 2030 period under both RFD scenarios (the population of Weston County is anticipated to decline during this period).

While continued growth could result in some short-term strains on county and community services and housing in some areas, particularly during periods of power plant and mine construction and large scale CBNG or oil and gas development, several factors would likely mitigate against major social disruption. The counties (Campbell, Converse, and Sheridan) and communities (Gillette, Wright, Douglas, and Sheridan) likely to host the majority of the energy development and associated population growth, have substantial experience with energy development and have developed planning and management mechanisms to facilitate growth management. Moreover, for major projects such as electric power plants, wind energy facilities, and coal and uranium mines, the provisions of the WIISA require disclosure and mitigation of potential community impacts. However, CBNG and conventional oil and gas development are exempt from the WIISA; therefore, the potential for adverse community and social impacts of large scale CBNG and conventional oil and gas development is much greater for these industries.

Sheridan County and the communities of Sheridan, Dayton, Ranchester, and other nearby smaller communities could experience social change under both RFD scenarios with the opening of a new coal mine in the county and the expansion of coal mining across the border in Montana. The latter would include a new coal mine and coal conversion project. The City of Sheridan and other communities in the area, potentially including Buffalo in nearby Johnson County, could host workers from these projects, stimulating new residential and commercial development, more motor vehicle traffic, and increased train traffic, particularly under the upper production scenario. Employment and population growth and diversity would likely be welcomed by many residents, but could present some challenges for the smaller communities in the 2010 through 2020 period. At the same time, some year-round and part-time residents/second-home owners in the area may be unreceptive to the development.

There is, however, potential for conflict and opposition within this general climate of acceptance and support. For the CBNG and conventional oil and gas development industries in particular, split estate issues and concerns relative to hydraulic fracturing, water use, and produced water disposal could result in conflict. Similarly, land use conflicts have risen in conjunction with the siting of wind energy projects within the study area. For all energy development, an active and engaged environmental community at the local, statewide, and national level could intervene in facility siting processes if environmental concerns arise. Moreover, there is an ongoing effort among local and national environmental groups to require consideration of climate change effects in the environmental assessment of coal leases and power plant construction.

4.0 References

AECOM. 2012. Task 1C Report for the Powder River Basin Coal Review, Current Social and Economic Conditions. Prepared for the Bureau of Land Management High Plains District Office and Wyoming State Office. December 2012.

_____. 2011. Task 2 Report for the Powder River Basin Coal Review, Past and Present and Reasonably Foreseeable Future Development Activities. Prepared for the Bureau of Land Management High Plains District Office and Wyoming State Office. December 2011.

_____. 2009. Update of the Task 2 Report for the Powder River Basin Coal Review, Past and Present and Reasonably Foreseeable Future Development Activities. Prepared for the Bureau of Land Management High Plains District Office and Wyoming State Office. December 2009.

Bureau of Land Management (BLM). 2012. Personal communication between M. Brogan, BLM, and R. Dutton, Sammons/Dutton, LLC, regarding anticipated future coal leasing. November 20, 2012.

Basin Electric Power Cooperative. 2012. Dry Fork Station (project overview). Internet website: http://www.basinelectric.com/Electricity/Generation/Dry_Fork_Station/index.html. Accessed October 2012.

Branch, K., J. Thompson, J. Creighton, and D. Hooper. 1982. The Bureau of Land Management Social Effects Project: Guide to Social Assessment. BLM_YA-PT_82-007-1606.

Consensus Revenue Estimating Group (CREG), State of Wyoming. 2012. Wyoming State Government Revenue Forecast, Fiscal Year 2013 – Fiscal Year 2018. October 2012.

U.S. Bureau of Economic Analysis. 2012. Interactive Website for Regional Economic Accounts, Local Area Personal Income and Employment, 1969 to 2010 for the U.S., Wyoming, and counties. Internet website: http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1&isuri=1&acrdn=5. Accessed March 2012. Individual data series include:

- Personal income, per capita personal income, and population (CA1-3);
- Personal income and employment summary (CA04);
- Total full-time and part-time employment by industry (CA25, CA25N);
- Personal current transfer receipts (CA35); and
- Gross flow of earnings (CA91).

U.S. Census Bureau. 2012. OntheMap interactive website application and longitudinal employer-household dynamics, including place of residence and place of work. Internet website. http://onthemap.ces.census.gov/. Accessed July and December 2012.

_____. 2011. Decennial Census of Population and Housing, Wyoming – 2010. Internet website: http://factfinder2.census.gov/faces/nav/jsf/pages/searchresults.xhtml?ref=geo&refresh=t#none. Accessed November 16, 2011.

U.S. Department of the Interior (USDOI). 2012. Office of Budget, Interactive website for Payments and Acreage by State/County, Fiscal Year 2011, State of Wyoming. Payments in Lieu of Taxes. Internet website: http://www.doi.gov/pilt/county-payments.cfm?term=county&state_code=WY&fiscal_yr=2011. Accessed June 2012.

U.S. Energy Information Administration (EIA). 2011. Annual Energy Outlook 2011, with Projections to 2035. U.S. Department of Energy. Washington, D.C. April 2011.

Wyoming Attorney General. 2012. Crime in Wyoming Annual Report, January through December 2011.

Wyoming Department of Administration and Information (WDAI). 2012. Wyoming and County Population Projections by Age and Sex: 2011 to 2030. Economic Analysis Division. Internet web site: http://eadiv.state.wy.us/pop/AgeSex_PROJ_2030.pdf. Accessed July 2012.

Wyoming Department of Education. 2012. Statistical Report Series #3 – Financial and Enrollment Data, 2000 to 2011. Internet website: http://edu.wyoming.gov/DataInformationAndReporting/StatisticalReportSeries3.aspx. Accessed July 2012.

Wyoming Department of Revenue. 2012. Wyoming Department of Revenue Annual Reports (a series). Internet website: http://revenue.state.wy.us/PortalVBVS/DesktopDefault.aspx?tabindex=2&tabid=10. Accessed July 2012.

Wyoming Department of Workforce Services. 2012. Commuting in Wyoming 2005Q1 to 2011Q3 (a data series). Internet website: http://doe.state.wy.us/lmi/commute/2012/default.htm. Accessed September 2012.

Wyoming Industrial Siting Division (WISD). 2012. Personal communication between T. Raamot and K. Wichmann, Principal Economists, Wyoming Department of Environmental Quality WISD and R. Dutton, Sammons/Dutton LLC. December 14, 2012.

Wyoming Oil and Gas Conservation Commission (WOGCC). 2012. On-line Statistics Interactive Retrieval Website for 2004 to 2011 Data. Internet website: http://wogcc.state.wy.us. Accessed July 2012.

Wyoming State Inspector of Mines. 2012. Annual report series of the State Inspector of Mines of Wyoming: Annual reports for 1970 through 2011. Internet website: http://www.wyomingworkforce.org/employers-and-businesses/mines/Pages/mining-information.aspx. Accessed June 2012.

4.1 Phase I References

The following references and associated information as presented in the Phase I reports (also cited below) and are carried over into this Phase II analysis.

Bureau of Land Management (BLM). 2003. Final Environmental Impact Statement and Proposed Plan Amendment for the Powder River Basin Oil and Gas Project. Wyoming State Office and Buffalo Field Office. January 2003.

_____. 1999. Wyodak Coal Bed Natural Gas Project Final Environmental Impact Statement. Buffalo Field Office. May 1999.

_____. 1996. Coal Development Status Check, Powder River Federal Coal Region, Montana and Wyoming, Data Tables. Wyoming BLM Buffalo Resource Area, Casper District, and State Office and Montana BLM Powder River Resource Area, Miles City District and State Office. For Presentation at the Powder River Regional Coal Team Meeting Held in Cheyenne, Wyoming, on April 23, 1996.

ENSR. 2005a. Task 1C Report for the Powder River Basin Coal Review, Current Social and Economic Conditions. . Prepared for the Bureau of Land Management Casper Field Office and Wyoming State Office. March 2005. March 2005.

_____. 2005b. Task 2 Report for the Powder River Basin Coal Review, Past and Present and Reasonably Foreseeable Future Development Activities. Prepared for the Bureau of Land Management Casper Field Office and Wyoming State Office. Revised October 2005 (with errata).

_____. 2005c. Task 3C Report for the Powder River Basin Coal Review, Cumulative Social and Economic Effects. Prepared for the Bureau of Land Management Casper Field Office and Wyoming State Office. December 2005.

Foulke, T., R. Coupal, and D. Taylor. 2002. Economic Trends in Wyoming's Mineral Sector: Coal. University of Wyoming Cooperative Extension Service. January 2002.

Montgomery Watson Harza. 2003. Coal Planning Estimates Report. Prepared for the Bureau of Land Management Wyoming State Office. March 2003.