APPENDIX 3

Review of Impacts to Socioeconomics, Air Quality, and Wildlife Based Upon Various Levels of Drilling Rigs

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The purpose of this appendix is to provide the reader with information on the degree to which the number of drilling rigs operating in the PAPA impacts key resources. The need for this discussion and the identification of these key resources was determined by comments received on the Draft SEIS.

Further, the BLM has determined that this discussion would be based upon the year-round development Alternatives, because these Alternatives contain mitigation measures that could result in changes to the number of drilling rigs operating in the PAPA. The reader should keep in mind that the impacts described in Chapter 4 for the various Alternatives assumed 48 drilling rigs would be operating in the PAPA at any one time, for purposes of analysis.

Socioeconomic

Of all the resources presented in this appendix, the socioeconomic impacts have the most distinction between the impacts from 20 drilling rigs and 60 drilling rigs.

The reader will recall from Chapter 4 that the number of development jobs is expressed as AJE, or annual job equivalents, not as number of workers. An estimated 47.4 annual job equivalents are associated with developing a gas well in the PAPA. Using 48 rigs to drill an average of 232 wells per year means that there would be approximately 10,997 development jobs, with development lasting for 19 years through 2025. This would generate approximately $563,801,528 per year (based on an estimated $2,430,179 earnings per well for drilling). The current peak number of drilling rigs (estimated at 34 drilling rigs) has created current conditions, with a tight housing market, an increase in housing costs, and a greater need for emergency services, traffic control, and infrastructure. It has also brought the economic benefits that have made the renovations and projects described in Section 3.5.1 of Chapter 3 possible, as well as a low unemployment rate. It has also lead to the current strain on infrastructure as expressed by the Town of Pinedale.

Using 20 drilling rigs to drill an average of 96 wells per year would create approximately 4,550 development jobs, with development lasting through 2052, or 46 years. This would generate the lowest amount of yearly earnings, at $233,297,184. It may also depend more heavily on a continuing demand for gas, with the need for good market conditions for a longer period of time than that required by 48 drilling rigs. The number of production jobs would be lower than for those required for 48 drilling rigs because the number of wells producing at any one time would be lower. This number of drilling rigs is even less than the number of drilling rigs that have been operating in the past 2 years. Decreasing to this number could create something of a bust, as the need for workers would be reduced, resulting in businesses closing, and empty housing, as people would move elsewhere to find employment. The crime rate would also be expected to decrease from current levels. It may also bring decreases in federal mineral royalties and ad valorem taxes because of slower rates of production.

Using 60 drilling rigs to drill an average of 289 wells per year would result in approximately 13,888 development jobs, with development lasting for 15 years through 2061. This would generate about $712,042,447 in earnings per year, more than under 48 rigs. This pace generates the highest number of development jobs and lasts the shortest amount of time. The number of production jobs would be higher than those needed with 48 drilling rigs because the

number of wells producing at any one time would be higher. This pace would create a greater need for services, as more people would move to the area to fill jobs. This would likely increase the strain on infrastructure. There would be more traffic resulting in more wear on the roads and increased demand for housing and emergency services. The crime rate would be expected to increase from current levels. However, it may also bring greater economic benefits, including higher federal mineral royalties and ad valorem taxes, due to the increased rate of production.

Air Quality

Air quality impact assessment modeling conducted for Alternative B indicated a maximum of 67 days per year of visibility impairment over 1.0 Δ deciviews (dv) at the Bridger Wilderness Area. The modeling was performed with the CALPUFF dispersion model using 3 years (2001, 2002, and 2003) of hourly windfields which were developed with the CALMET meteorological model. CALPOST method 6 for visibility processing combined with FLAG natural background data and regional haze rule monthly relative humidity factors applicable to the Bridger Wilderness Area were used (BLM visibility test).

Alternative B emissions were based on a maximum emissions scenario that included both construction and production activities expected to occur in year 2009. This scenario included emissions from 48 drilling rigs of which four were assumed to have Tier 0 emissions levels, 15 at Tier 1 levels, and 29 at Tier 2 levels.

Three additional CALPUFF model runs were performed for Alternative B modeling scenario that included "scaling" the drill rigs emissions modeled for 48 drill rigs to account for the emissions from 10, 20, and 60 drill rigs. Visibility impacts were modeled at the Bridger Wilderness Area. The modeling results are shown below:

Number of Drilling Rigs	Days of Visibility Impairment at the Bridger Wilderness Area over 1 dv
10	13
20	26
48	67
60	77

This analysis indicates the effect that drilling rig emissions have on visibility impacts at the Bridger Wilderness Area. Using a fleet of 10 drilling rigs in the PAPA with a mix of Tier 0, Tier 1, and Tier 2 emissions levels would not achieve the BLM's goal of 0 days of visibility impairment over 1.0 dv.

Using a fleet of drill rigs with refined emissions controls would have a larger effect on visibility impacts. Shown below are the emission factors and emission rates in pounds per hour (lb/hr) for a typical size drill rig (3,875 hp) used in the Pinedale Anticline area.

Emissions Level	Emission Factor (g/hp-hr)	Emission Rate (lb/hr)[1]
Tier 0	10.89	39.07
Tier 1	6.90	24.76
Tier 2	4.5	16.15
Tier 4 (Natural Gas)	1.0	3.59
[1] Includes a 0.42 load factor.		

This table indicates that the emissions from a natural gas-fired drilling rig are more than a factor of 10 less than the emissions from a drilling rig with Tier 0 controls, and more than 4 times less than a drilling rig with Tier 2 controls.

Wildlife

Current plans for utilizing 48 rigs per year to drill 4,399 wells require 19 years, from 2007 to 2025. That drilling intensity means that, on average, 232 wells would be drilled each year. Production would end in 2065.

If drilling was restricted to 20 rigs per year, an estimated 46 years would be required to drill 4,399 wells. Consequently, wellfield development would extend through 2052 with an average of 96 wells drilled each year. Production is expected to last through 2092.

With 60 drilling rigs allowed to operate each year, development would require only 15 years, ending in 2021. Year-round development by 60 rigs per year would average 293 wells drilled per year. At that pace of development, production would be expected to last through 2061.

Regardless of the number of rigs per year, the same amount of surface disturbance would occur although within the different timeframes estimated, above.

Any increase in traffic, noise, and associated human presence within seasonal wildlife habitats during otherwise seasonally restricted periods is likely to increase effects to wildlife. This expectation is based on observations of wildlife responses to wellfield development through 2006, most of which have occurred without year-round development. The responses were reviewed in Chapter 3. At the very least, effects to wildlife similar to observed levels with minimal year-round development are possible but increased levels of effect seem a more reasonable expectation.

If 20 drill rigs per year are utilized, development would take until 2052 and production-related activities would last approximately 40 years, until 2092. This would mean that the annual level of development activity would be reduced from what it is today (assumed 96 wells drilled per year). Under this scenario, fewer well pads would be active at any one time though that assumption may vary by Alternative. In any case, the progression of wellfield development across the PAPA landscape would probably be similar to that analyzed with 48 rigs per year for any of the Alternatives, but expected progressions would take longer.

There would be fewer noise sensitive receptors (greater sage-grouse leks) impacted at any given time because there would be fewer rig locations within each Alternative's core area at any one time. The slower pace of development would result in decreased production simultaneously with development and would probably not result in a spike of traffic compared to expected levels associated with 48 drilling rigs operating, particularly during winter. Declines in greater sage-grouse lek attendance would be expected to be less than predicted by drilling with 48 rigs per year, but would likely continue. Fewer numbers and subsequent locations of drilling rigs would allow for more functional wintering habitat for use by big game when compared to expected effects by of 48 rigs drilling year-round. This would result in less intense impacts to wildlife than those expected by year-round development with 48 rigs, but effects to wildlife would most likely exceed those observed through 2006. Effects would last over a longer period of time than development with 48 rigs per year. Also, impacts anticipated during the production phase would likely last though 2092.

If 60 drill rigs are utilized, development would take 15 years until 2021 and production-related activities would last approximately 40 years, though 2061. This is a considerable increase in the level of annual development from what it is today because an average of 293 wells would be drilled in each of the 15 years. More well pads would be active at any one time. The progression of wellfield development across the PAPA landscape would probably be similar to that analyzed with 48 rigs per year for any of the Alternatives, but expected progressions would advance relatively quickly.

Because the drilling rigs would occupy more places at any one time, there would be more noise sensitive receptors impacted at any given time. The increase in the pace of development would result in a spike in production-related traffic and this would correlate to a spike in the number of production-related vehicle trips compared to expected levels with 48 rig operating year-round. The decline in greater sage-grouse lek attendance would be expected to accelerate. More numbers and subsequent locations of drilling rigs would result in less functional wintering habitat for use by big game when compared to expected effects by 48 rigs drilling year-round. The increase in the traffic would result in more vehicle trips on roads, and likely cause mule deer to further avoid roads. This would result in more intense impacts compared to development with 48 rigs per year but development-related impacts would last for a shorter period of time. Impacts anticipated during the production phase would likely last though 2061.