

CHAPTER 4

ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION

This chapter of the environmental assessment provides an analysis of the potential environmental consequences that would result from implementation of the Proposed Action (federal land development of twelve well locations, access roads, associated facilities and reclamation) and No Action (denial of further federal land development) in the Brown Cow project area (BCPA). Measures that would avoid or reduce impacts under the Proposed Action have been included in Chapter 2. The following impact assessment takes these measures into consideration. Additional opportunities to mitigate impacts beyond the measures proposed in Chapter 2 are presented in this chapter under Mitigation Summary for each resource discipline.

As discussed in Chapters 1 and 2 of this EA, the BCPA lies within the proposed Atlantic Rim CBM project area (Figure 1-2). Drilling and field development activities associated with the Brown Cow EA Proposed Action would be guided by the Interim Drilling Policy (IDP) (see [Appendix A](#)), The IDP is a management tool to guide project planners in allowable actions that may be approved during interim exploration while the Atlantic Rim EIS is being prepared. Any approval or authorizations for this project will come from the Decision Record and Finding of No Significant Impact (FONSI) to this EA.

This analysis of environmental consequences addresses only those direct and indirect impacts associated with exploration and development of the Brown Cow interim development pod. The Proposed Action is primarily within an existing gas producing area and would use existing infrastructure for access to and transport of new production. New disturbance would be reduced by use of existing roads, well pads, and injection wells. Information regarding resources in the project area, such as cultural, paleontological, geologic hazards, soils, subsurface water, etc. is available from past drilling and development.

The difference between the Proposed Action and No Action alternatives is small for this project due to the following. The Proposed Action would consist of a 12 well development program, utilizing existing infrastructure to the greatest extent reasonable. The No Action alternative would deny implementation of the proposed action, but the USDI BLM would still be required to allow current production to continue, and new wells could be approved on a case by case basis within existing environmental analyses, as explained in Section 2.2.

The description of the environmental consequences for each resource section in this chapter includes the following subsections:

Impacts The level and duration of impacts that would occur as a result of the Proposed Action or the No Action Alternative. The impact evaluation assumes that the applicant-committed practices described in Chapter 2 would be implemented

Mitigation - A summary of additional measures that could be applied to avoid or reduce impacts. Also, because of the similarity between the Proposed Action and No Action, it is assumed that the mitigation described applies to both alternatives. The measures identified under this section would be considered for application to all Bureau of Land Management-(BLM)

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administered lands. If no additional mitigation is proposed, the mitigation and residual impact sections will not be discussed.

Residual Impacts - A summary of impacts that remain after the application of available and reasonable mitigation and, therefore, would remain throughout the duration of the project and to some point beyond.

Cumulative Impacts - A description of impacts likely to occur due to this project in combination with other on-going and recently approved activities, recently constructed projects and other past projects, and projects likely to be implemented in the near future (reasonably foreseeable future actions or RFFA's).

This environmental analysis addresses cumulative impacts associated with exploration and development of 200 interim CBM wells and other activities, on-going or proposed, within the Atlantic Rim project area. Cumulative impacts associated with exploration and development of the Brown Cow pod are shown in Section 4.15 of this EA..

4.1 GEOLOGY/MINERALS/PALEONTOLOGY

4.1.1 Impacts

4.1.1.1 Proposed Action

Utilization of proper construction techniques described in Chapter 2 would minimize impacts resulting from the topographic alteration of developing twelve CBM wells and associated facilities. As discussed in Chapter 3, no major landslides have been mapped within the project area. Following prescribed procedures construction activities would not likely activate landslides, mudslides, debris flow, or slumps. Seismic activity is low in the area, so the potential for damage of project facilities is minimal.

Inventory of geologic resources revealed no major mineral resources that would be impacted by implementation of the project other than CBM reserves. Drilling of CBM wells would better define the location and nature of CBM resources available within the BCPA. Recovery of CBM would result in the depletion of the natural gas resource.

As discussed in Chapter 2, Project-Wide Mitigation Measures, the mitigation measures presented in the Soils and Water Resources sections would avoid or reduce potential impacts to the surface geologic environment. Implementation of these measures and adherence to Federal and State rules and regulations regarding drilling, testing and completion procedures would avoid or reduce potential impacts to the subsurface geologic environment.

Impacts could occur to the paleontology environment if surface disturbance associated with the Proposed Action results in the exposure and destruction of fossil resources, along with associated loss of geologic information. However implementation of the Proposed Action could also result in new fossil resources being discovered and properly recovered and cataloged into the collection of a museum repository, so that they are available for study.

No existing fossil localities have been identified in the sedimentary deposits that underlie the BCPA, including the late Cretaceous Lance Formation and Lewis. The Lance Formation

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satisfies BLM Paleontology Condition 2, in that they include areas with exposures of geological units or settings that have high potential to contain vertebrate fossils or noteworthy occurrences of invertebrate or plant fossils. According to the BLM the presence of geologic units from which such fossils have been recovered elsewhere may require further assessment of these same units where they are exposed in the area of consideration. The Lewis Shale satisfies Paleontology Condition 3.

Based on Probable Fossil Yield Classifications (PYCF) under development by the BLM Wyoming State Office (Hanson 2003) the Lance Formation is considered a Class 5 formation and the Lewis Shale is a Class 3 formation. Paleontology Class 5 formations include highly fossiliferous geologic units that regularly and predictably produce either vertebrate fossils or scientifically significant non-vertebrate fossils, or both. The presence of a geologic unit from which such fossils have been recovered elsewhere may require further assessment of the same unit where it is exposed in the area of consideration. Class 5 formations are at risk of natural degradation or human-caused adverse impacts, or both, and require appropriate consideration during environmental evaluation of potential effects to paleontology of surface disturbing activities. Mitigation recommendations for the Lance Formation is provided in Section 4.1.3.1.

Class 3 Paleontology Formations are fossiliferous sedimentary units where fossil content varies in significance, abundance, and predictable occurrence. The land manager's concern for paleoresources on Class 3 acres may extend across the entire range of management. Ground disturbing activities require sufficient mitigation to determine whether paleoresources occur in the area of a proposed action. Mitigation beyond initial findings would range from no further mitigation necessary to full and continuous monitoring of significant localities during the action. No fossil localities are known in the Lewis Shale in the BCPA and the formation is less likely to yield them than the Formation. As a result, no specific mitigation measures are recommended for the Lewis Shale beyond that described in Chapter 2 (Section 2.1.8.2.4).

4.1.1.2 Alternative A - No Action

Under the No Action Alternative, the existing developments in the area would continue. New wells could be proposed, assessed, and possibly approved on a case by case basis.

4.2 AIR QUALITY

4.2.1 Impacts

4.2.1.1 Proposed Action

Under the proposed action, air emissions would occur from the construction and production of coalbed methane wells within the project area. Construction emissions would include PM-10, SO₂, NO_x, CO, and VOCs, from ground-clearing, heavy equipment use, drilling, and completion activities, as well as the construction of necessary additional roads. Construction emissions are temporary and would occur in isolation, without interacting with adjacent wells.

Production emissions of NO_x, CO, SO₂, VOC, and HAPs (formaldehyde) would result primarily from methane gas- or diesel-powered electric generators used to power pumps operating temporarily throughout the BCPA. The emissions generated from methane gas-fired operations would contain negligible amounts of SO₂ and particulate matter due to the composition of coalbed methane gas. Emissions from electric generators would occur until electric line power

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is available in the field. Emissions from the coalbed methane wells would be negligible since the coalbed methane gas composition in the BCPA is nearly 100 percent methane and there is no additional production equipment required at well sites. No new compressor engines are proposed in the BCPA at this time.

Pollutant emissions from the construction and operation of natural gas fields in the vicinity of the BCPA have been analyzed in air quality studies performed under NEPA by the BLM. Studies conducted for the Desolation Flats Natural Gas Development Project (BLM, 2003) and for the Continental Divide/Wamsutter II and South Baggs Natural Gas Development Projects (BLM, 1999) indicated potential near-field increases in CO, NO₂, PM-10, and SO₂ concentrations. However, the predicted maximum concentrations were found to be well below applicable state and National Ambient Air Quality Standards. Similarly predicted HAP (formaldehyde) concentrations were found to be below 8-hour maximum Acceptable Ambient Concentration Levels, and the related incremental cancer risks to residences would also be below applicable interest levels

The Desolation Flats Natural Gas Field Development Project included the development of 592 wells. The Continental Divide project analyzed over 3000 wells and the South Baggs project included 90 wells. Based on the relative size of the Proposed Action (12 wells and no new compressor engines) when compared to the magnitude of these projects, no ambient air quality standards would be violated or adverse air quality conditions would be expected to result from the Proposed Action.

4.2.1.2 Alternative A - No Action

Potential air quality impacts would less than those described under the Proposed Action, with impacts from existing field emissions sources remaining at current levels.

4.3 SOILS

4.3.1 Impacts

4.3.1.1 Proposed Action

Approximately 38.8 acres of soils resources would be temporarily disturbed during drilling and field development; after initial reclamation, approximately 7.5 acres would remain disturbed over the life-of-project (see Table 2-2).

Increased susceptibility to wind and water erosion would be a direct impact in newly disturbed areas and may cause sedimentation in drainage channels or impoundments. Soil compaction caused by equipment traffic or by increased raindrop impact after loss of surface vegetation cover would decrease infiltration and percolation, increase runoff, and reduce overall water storage capacity. Susceptibility to erosion would occur primarily in the short term and would decline rapidly over time due to the use of proper construction and reclamation techniques and the implementation of mitigation measures described in Chapter 2.

Due to the high amount of salt or sodium content/high clay material within the project area disturbance and/or use of this material is discouraged. Sodium affected soils could contaminate suitable material and cause dispersion of clays and sealing of reclaimed surfaces. Other direct

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chemical impacts to the soil resource could also include reduction of overall fertility based on length of stockpiling of material and loss of nutrients (FS 1984); possible oxidation and release of elements such as boron or selenium, although no analyses were conducted.

Stripping of high clay material, surface sandy or gravelly material, as well as channery material in the subsoil, could reduce the physical suitability of the soil resource used from reclamation. If stripped and stockpiled with suitable material, contamination could result in increased droughtiness and decreased fertility, of reclamation material, as well as hamper actual seeding operations. Other physical impacts to the soils resource during stripping may include: loss of soil structure and decreased permeability; mixing of various textures; and solution of surface organic matter and subsequently soil biota. Stockpiling soil material could degrade physical properties of the soil resource such as bulk density, in addition to the biological and chemical effects mentioned earlier (FS 1984). In addition, stockpiling of material can increase the potential for soil loss until the soil is revegetated.

Topsoil quality in the project area varies based on local topography and source of parent material. Primary limitations overall include: salt or sodium content; high clay content; thin soil development or inaccessibility to stripping operations; channery or high coarse fragment content; or sandy or gravelly soils. Revegetation potentials range from mostly fair to poor, with some areas rated as good. In addition to these limitations, low annual precipitation, susceptibility to wind and water erosion, and short growing season could make reclamation in the project area more difficult.

Due to the small area of disturbance and use of proper construction and reclamation techniques and implementation of mitigation described in Chapter 2, impacts to soil resources in the SDPA are anticipated to be minimal.

4.3.1.2 Alternative A - No Action

Under this alternative, impacts to the soils environment would be similar to those described for the Proposed Action but of a smaller magnitude.

4.4 WATER RESOURCES

4.4.1 Impacts

4.4.1.1 Proposed Action

Surface Water Potential impacts that could occur to the surface water system due to the Proposed Action include increased surface water runoff, off-site sedimentation due to soil disturbance associated with construction activities, water quality impairment of surface waters due to increased sedimentation and stream channel morphology changes due to road and pipeline crossings. The magnitude of the impacts to surface water resources would depend on the proximity of the disturbance to a drainage channel, slope aspect and gradient, degree and area of soil disturbance, water management methods, soil character, duration of time within which construction activities occur, and the timely implementation and success of mitigation measures. Adverse sedimentation is not expected to occur as a result of implementation of the Proposed Action due to compliance with RMP management directives and Executive Order 11990. Both regulations require avoidance of stream channels to the maximum extent possible.

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Where total avoidance is not practical, the BLM AO will be shown why a stream channel and/or floodplain cannot be avoided and how the impacts would be minimized.

Construction activities would occur over a relatively short period of time. Construction impacts would likely be greatest shortly after the start of the project and would decrease in time due to stabilization, reclamation, and revegetation efforts. The construction disturbance would not be uniformly distributed across the project area, but rather, project construction activities would be concentrated within and around the wells.

The proposed project would require relatively little water demand and would not adversely affect existing surface or groundwater sources or rights. The project will use no more than 4.02 acre-feet of water for drilling, completion and dust control operations during construction operations. This water will come from municipal water supplies in Baggs, Wyoming. This water use will not result in surface water depletions and will be contained in reserve pits according to standard drilling practices.

Groundwater The primary impact of the Proposed Action on groundwater resources is best described as the loss of some hydraulic pressure head in the affected coal seam aquifer, and an increase in pressure head in the aquifer in which the coalbed water is injected. The partial removal of groundwater from the coal aquifer results in the reduction of the hydraulic pressure head, thus lowering the water levels in nearby wells completed in the same coal seam. The lowering of water levels in an aquifer is referred to as drawdown. Conversely, water levels will rise in wells completed in the injection zone.

SEO records indicates 13 permitted wells are completed in the Lance Formation, Lewis Shale, the Mesaverde Group, and Quaternary age Alluvium within a one-mile radius of the project area.

Well drilling and completion should have little adverse impact on existing groundwater quality. The improbable degradation of groundwater quality within any aquifers in the project area essentially eliminates the possibility of adverse effects to the area's groundwater right holders. A description of the geology and hydrology of the BCPA is given in Chapter 3.

CBM exploratory wells would produce water that would be disposed of in two injection wells. The proposed injection targets for both injection wells are the Cherokee and Deep Creek Sandstones, which are some 3,000 feet stratigraphically below the coal zones being explored. Background water quality analyses of the injection horizon currently are not available, but it is anticipated that the CBM-produced water that would be injected would be of equal or higher quality in regards to class of use as defined by WDEQ regulations. Injection of the CBM-produced water is not expected to result in any deterioration in groundwater quality within the injection horizon. These sandstones are isolated above and below by competent shale barriers that would prevent the infiltration of the injected water into any overlying fresh water zones. The only effect on the injection horizons would consist of an increase in hydrostatic head emanating from the injection well, which would dissipate with distance away from the wellbore. In terms of water quantity and quality, the Proposed Action's effect on the injection horizon would be minimal. The fracture gradient of the shale aquitards that overlie and underlie the injection horizons would not be expected to be exceeded, so all injected water would be contained in the injection horizon and would not migrate vertically. The fracture gradient will be determined by testing, and no injection will be allowed above that gradient. For this reason, the injected water is not expected to degrade water quality of the Mesaverde, or nearest, aquifer.

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Groundwater would be removed from a formation that is stratigraphically lower and hydraulically isolated from shallow groundwater sources that typically are developed with water wells. The proposed injection zone is also stratigraphically lower than the shallow groundwater sources. Shallow groundwater sources (stratigraphically above the Mesaverde coal zones) are not likely to be affected by the Project.

Monitoring of the quality of CBM produced water, the volume of water produced over time during testing, and the static water levels in nearby wells before, during, and after completion of Project activities would provide information about the groundwater system in the Project Area. This information also would be used to quantify interim drilling project impacts for use in evaluating future field development.

As all produced water is to be injected under the Project, surface water quality or quantity would not be affected directly by the disposal of produced water. Merit would implement BMPs to ensure spills of produced water do not occur.

Implementation of the Brown Cow Project would temporarily decrease water levels from present static conditions within the coal seam aquifer. Relative to the available drawdown within the aquifer, these impacts would be of minor effect. A complete drawdown analysis will be presented in the Atlantic Rim EIS. No measurable impacts to groundwater quantities or qualities are expected from this project.

4.4.1.1 Alternative A – No Action

Impacts to water resources under this alternative would be similar to the Proposed Action but of a lesser magnitude.

4.5 VEGETATION/ WETLANDS/NOXIOUS WEEDS

4.5.1 Impacts

4.5.1.1 Proposed Action

4.5.1.1.1 Vegetation Cover Types

The Proposed Action assumes construction of a total of 12 wells with a supporting infrastructure. Construction and installation of well sites, access roads, and ancillary facilities (including pipelines) would directly reduce the extent of vegetation cover types through disturbance, reduction, and/or removal of vegetation. Potential indirect impacts to the vegetation resource may occur as a result of soil compaction, mixing of soil horizons, loss of topsoil productivity, increased soil surface exposure, and soil loss due to wind and water erosion. During the project's development phase, the Proposed Action would create a surface disturbance of about 38.8 acres (see Table 2-2) which represents about 2.5 % of the surface area of the BCPA. This disturbance would be distributed among the primary and secondary vegetation types on the BCPA identified by the Wyoming GAP Analysis (Merrill et al. 1996).

During the operations (production) phase, all pipeline ROW's would be reclaimed. Of the initial 12.6 acres disturbed by drill pads, approximately 0.06 acre would remain disturbed after

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reclamation for the life of the project (LOP). The projected two injection wells (1.03 acres each), and two pumping stations (0.66 acres each) and new roads (5.8 acres) would result in about 7.5 total disturbed acres during the LOP, assuming reclamation is successful. The initial disturbance associated with the construction phase would be reduced to about 7.5 acres over time which represents about 0.5% of the BCPA total land surface area. Any potential impacts would be minimized assuming construction, maintenance and operation of well pad sites and associated disturbances are in accordance with Chapter 2 of this EA, the Interim Drilling Policy, and RMP requirements.

Disturbance of the Wyoming big sagebrush, alkali sagebrush, Utah juniper, greasewood, and saltbush cover types under the Proposed Action would be minor, given that all these associations commonly occur in this area of south-central Wyoming. The short- or long-term loss in acreage described above would have a negligible impact on the overall abundance, distribution, or quality of these habitats.

In general, the extent and duration of impacts on vegetation in the project area would be influenced by the success of mitigation and reclamation efforts and the time required for natural succession to return disturbed areas to pre-disturbance conditions. Reestablishment of pre-disturbance conditions would be influenced by climatic (growing season, temperature, and precipitation patterns) and edaphic (physical, chemical, and biological soil conditions) factors. This would include the amount and quality of topsoil salvaged, stockpiled, and re-spread over disturbed areas. Reseeding and reclamation efforts could proceed after cessation of surface-disturbing activities and original contour and grade are achieved as discussed in Chapter 2 of this EA.

4.5.1.1.2 Wetlands and Waters of the U.S.

Due to a paucity of wetland/riparian sites on the BCPA, the probability of well pads, roads, or pipelines impacting these resources is low. The RMP specifies that a 500 foot minimum buffer around riparian and other water resources (including springs and seeps) will be maintained. Permits under Section 404 of the Clean Water Act would be required for any activities in potential wetlands. Merit would be required to demonstrate to the ACOE that there are no "practical alternatives" to placement of a well location in a wetland. The probability of impacting wetlands and other waters of the U.S. under the Proposed Action is low given the xeric nature of the BCPA and identified mitigation procedures stated in Chapter 2, Merit's APD's, the RMP, ACOE and BLM surface-disturbing guidelines.

4.5.1.1.3 Invasive/Noxious Weeds

Surface disturbing activities could increase the potential for infestation and spread of invasive (includes noxious) plant species. Invasive species, especially weeds, usually thrive on newly disturbed surfaces such as road and pipeline ROW's and out-compete more desirable plant species. As explained in Chapter 2, Merit will be responsible for the management and control of all invasive (including noxious) weed infestations on project-related surface disturbances during the projected LOP and will consult with the BLM Authorizing Officer (AO) and/or local Carbon County Weed and Pest Control District authority for acceptable weed control methods.

The RMP provides no guidelines for herbicide utilization within the RFO management area. Vegetation management activities allowed, including herbicides are detailed in the Record of Decision for Vegetation Treatment on BLM Lands in the Thirteen Western States. However,

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good management practice requires that herbicide loading sites will be located at least 500 feet from live water, floodplains, riparian areas, and all special status plant locations. Aerial spraying of chemicals would be prohibited within 1/4 mile of special plant locations with hand application prohibited within 500 feet. Control measures would adhere to those allowed in the *FEIS, Vegetation treatment on BLM lands in the thirteen western states* (USDI-BLM 1991).

4.5.1.2 Alternative A - No Action

Under this alternative, additional APD's and ROW actions could be considered by the BLM on a case-by-case basis consistent with individual site-specific environmental analysis. Transport of natural gas products would be allowed from those wells in the BCPA that are currently productive. Given the unknown extent of these actions, it would be speculative to accurately predict potential impacts on vegetation under the No Action alternative.

4.6 RANGE RESOURCES AND OTHER LAND USES

4.6.1 Impacts

4.6.1.1 Range Resources

4.6.1.1.1 Proposed Action

Anticipated impacts to range resources associated with the Proposed Action are limited to a minimal loss of forage and associated AUM's, an increased potential for vehicle/livestock collisions and an increased potential for the spread of noxious and invasive weeds.

The BCPA lies within the Cherokee Grazing Allotment, described in Section 3.6. Livestock grazing activities would continue during the drilling, field development and operations phases of the project. Forage in the project area would be reduced slightly during drilling and field development and restored as soon as practical thereafter, except for areas used for roads, production equipment and ancillary facilities, which would remain disturbed throughout the productive life of the field (about 7.5 acres).

The increased traffic in the BCPA during the drilling and field development phase would correspondingly increase the potential for vehicle/livestock accidents during that period.

The average stocking rate for the Cherokee Allotment is about 10 acres per AUM. Consequently, the Proposed Action would result in a short-term loss of about 4 AUM's, and long-term loss of less than one AUM. These losses would amount to less than one percent of the total AUM's allocated for this allotment.

Based on the assumptions and estimates contained in this assessment, the Proposed Action would not result in impacts to range resources.

4.6.1.1.2 Alternative A- No Action

Impacts resulting from the implementation of this alternative would be similar to those described under the Proposed Action.

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4.6.1.1.3 Mitigation

The BLM would recommend that the operator establish speed limits in the BCPA and coordinate with affected livestock operators to minimize disruption during livestock operations, including lambing season and when young calves are present..

4.6.1.1.4 Residual Impacts

Loss of livestock due to vehicle collisions would be reduced over the long term.

4.6.1.2 Other Land Use

4.6.1.2.1 Proposed Action

Potential impacts to other land uses are limited to recreation resources and wildlife habitat, which are discussed under the sections dealing with those resources.

As described in section 3.6, other land use on and adjacent to the proposed action include wildlife habitat; oil and natural gas exploration, development, and transportation; and dispersed outdoor recreation (primarily hunting in the fall). Effects on wildlife resources are described in Section 4.7. Effects on recreation resources are described in Section 4.9. The preconstruction planning and site coordination process and measures described in Chapter 2 would reduce the potential for conflict with existing oil and gas pipelines, road ROW's and other oil and gas leases.

4.6.1.2.2 Alternative A - No Action

Under the No Action Alternative, other land use conditions described in Chapter 3.6 would remain relatively constant, with the exception that other oil and gas leases on or near the project area might be developed.

4.7 WILDLIFE

4.7.1 Impacts

4.7.1.1 Proposed Action

The proposed development would disturb approximately 38.8 acres, during production phase, of general wildlife habitat. Approximately 7.5 acres of long-term disturbance would remain following reclamation. Analysis of potential impacts of the proposed development upon wildlife assumes development of the wells in the approximate locations identified in Figure 4-1.

During the production phase, the unused portion of well sites and pipelines would be reclaimed. Following completion of production operations (life of the project is estimated at 10-20 years), the well field and ancillary facilities would be reclaimed and abandoned. Well pads would be removed and the areas revegetated with seed mixes approved by the BLM, some of which are specifically designed to enhance wildlife use. The duration of impacts to vegetation would depend, in part, on the success of mitigation and reclamation efforts and the time needed for natural succession to return revegetated areas to predisturbance conditions. Grasses and forbs

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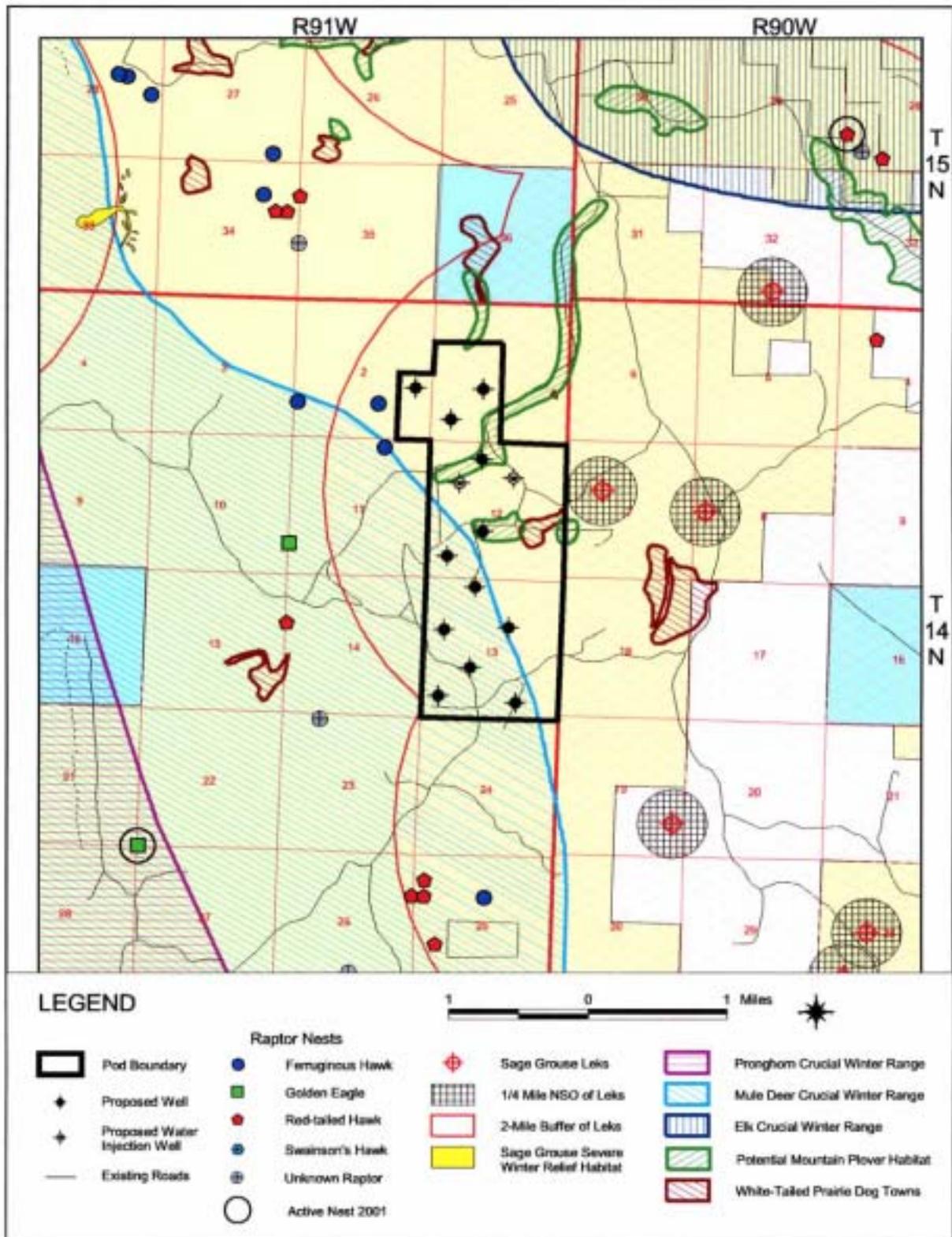


Figure 4-1. Wildlife Concerns in Relation to Proposed Well Locations.

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are expected to become established within the first several years following reclamation, however, much more time would be required to achieve reestablishment of shrub communities. Consequently, disturbance of shrub communities would result in a longer-term loss of those habitats.

In addition to the direct loss of habitat due to construction of well pads and associated roads and pipelines, disturbances from human activity and traffic would lower wildlife utilization of habitat immediately adjacent to these areas. Species that are sensitive to indirect human disturbance (noise and visual disturbance) would be impacted most. Habitat effectiveness of these areas would be lowest during the construction phase when human activities are more extensive and localized. Disturbance would be reduced during the production phase of operations and many animals may become accustomed to equipment and facilities in the gas field and may once again use habitats adjacent to disturbance areas.

4.7.1.1.1 General Wildlife

The direct disturbance of wildlife habitat in the BCPA and outside of the pod under the proposed development would reduce habitat availability and effectiveness for a variety of common small mammals, birds and their predators. The initial phases of surface disturbance would result in some direct mortality to small mammals and the displacement of songbirds from construction sites. In addition, a slight increase in mortality from increased vehicle use of roads in the project area is expected. Quantification of these losses is not possible; however, the impact is likely to be low over the short-term. Due to the relatively high production potential of these species and the relatively small amount of habitat disturbed, small mammal and songbird populations would quickly rebound to pre-disturbance levels following reclamation of pipelines, unused portions of roads, well pads, and wells that are no longer productive. No long-term impacts to populations of small mammals and songbirds are expected.

4.7.1.1.2 Big Game

In general, impacts to big game wildlife species would include direct loss of habitat and forage, and increased disturbance from drilling, construction, and maintenance operations. Disturbance of big game species during the parturition period and on winter range can increase stress and may influence species distribution (Hayden-Wing 1980, Morgantini and Hudson 1980). There may also be a potential for an increase in poaching and harassment of big game, particularly during winter. According to management directives in the RMP (USDI-BLM 1990), important big game winter ranges will be closed from November 15 - April 30, this closure of areas located in crucial big game winter ranges will reduce disturbance to wintering big game. This closure would also limit the potential for poaching and/or harassment of big game species wintering in the area. Depending upon local weather and site conditions, the BLM would consider exception requests on an individual basis for alteration of these closure dates.

Pronghorn Antelope. The BCPA supports antelope throughout the year. All of the BCPA is classified as pronghorn winter/yearlong range. Approximately 38.8 acres of pronghorn winter/yearlong range would be disturbed under the proposed action. Following reclamation, approximately 7.5 acres of winter/yearlong range would remain disturbed for the LOP.

Activities associated with the construction phase of the project would likely temporarily displace antelope, however, once construction is complete antelope would likely habituate and return to

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pre-disturbance activity patterns. Reeve (1984) found that pronghorn acclimated to increased traffic volumes and machinery as long as the traffic and machines moved in a predictable manner. The displacement of pronghorn and disturbance of habitats is considered a minor short-term impact because of the temporary nature of the displacement and the availability of comparable habitats in adjacent areas.

Mule Deer. The BCPA supports mule deer year round. Approximately one-third of the pod is classified as mule deer crucial winter/yearlong range. Six of the proposed wells (Figure 4-1) would be placed within the crucial winter/yearlong range, resulting in approximately 18.6 acres of disturbance of this range type. Following reclamation, approximately 2.9 acres of mule deer crucial winter/yearlong range would remain disturbed for the LOP.

During winter, mule deer primarily utilize shrubs including sagebrush, mountain mahogany, and antelope bitterbrush (DeBolt 2000). Specific placement of roads and wells to avoid destroying habitat patches containing these shrub species will lessen the impact upon the crucial winter range vegetation in the project area. Overall, impacts upon mule deer winter habitat should be limited and no long-term impacts to mule deer in the area are expected because a very small percent of the crucial winter/yearlong range would be disturbed and the availability of similar habitats in the surrounding area. Further, reclaimed disturbance would result in a short term enhancement in forage for mule deer due to young grasses and forbs present in seed mixes.

Disturbance is also a factor that should be considered for big game species. According to management directives in the RMP, crucial big game winter ranges will be closed from November 15 - April 30. This closure of areas located in mule deer crucial winter/yearlong range would reduce disturbance to mule deer wintering on the project area. This closure would also limit the potential for poaching and/or harassment of mule deer. As mentioned above, exceptions may be considered by the BLM, but granting of these exceptions would only occur if weather and site conditions are conducive to minimization of wildlife impacts. No adverse impacts upon the mule deer population utilizing the project area are expected provided that mitigation measures contained in this document and the RMP are implemented.

Elk. The Brown Cow Pod supports elk during the winter months and all of the pod is classified as elk winter range. A total of 38.8 acres of elk winter range would be disturbed under the proposed action. Following reclamation, approximately 7.5 acres of elk winter range would remain disturbed for the LOP. During winter, elk utilize most of the same shrub species preferred by mule deer, but prefer grasses when they are available. Spatial separation of elk and mule deer on the winter range may occur (Hayden-Wing 1980), but they often utilize the same areas (DeBolt 2000). Overall, impacts upon elk habitat would be negligible.

4.7.1.1.3 Wild Horse Management

Wild horses do not occur on the BCPA nor does the project area lie within any BLM designated Horse Management Area (HMA). Therefore, wild horse management is a non-issue for the BCPA and will not be discussed further.

4.7.1.1.4 Upland Game Birds

Greater Sage-grouse. Suitable greater sage-grouse habitat is abundant on and around the project area and specific measures must be taken to avoid impacting this species. Sage grouse are of special concern because populations throughout the west have been declining and they

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are likely to be petitioned for listing under the ESA. Under the Proposed Action, 32.3 acres of the Wyoming big sagebrush vegetation cover type would be disturbed during construction and 6.2 acres in the long-term. This amount of habitat disturbance is minimal (0.4% long-term) considering the amount available in the project area, however, sage grouse can be impacted by other activities associated with development including increased human activity, increased traffic disturbance, and pumping noises. Steps should be taken to ensure that impacts to leks, nesting areas, and severe winter relief habitats are minimized. Four active sage grouse leks have been identified within two miles of the project area (Figure 4-1), with one additional inactive lek located on the pod.

Construction activities within a two-mile radius of active leks would be restricted between March 1 and June 30 to provide protection for grouse during the egg-laying and incubation period. Exceptions may be granted if the activity will occur in unsuitable nesting habitat. If all avoidance and mitigation measures identified in this document, the RMP, and the Interim Drilling Policy are implemented, impacts to greater sage-grouse are expected to be minimal.

4.7.1.1.5 Raptors

The potential impacts of the Proposed Action on raptors are: (1) nest abandonment and/or reproductive failure caused by project related disturbance, (2) increased public access and subsequent human disturbance resulting from new road construction, and (3) small, temporary reductions in prey populations.

The primary potential impact to raptors from project activities is disturbance during nesting that might result in reproductive failure. To minimize this potential, disturbance would not be allowed during the critical nesting season (Feb. 1 - July 31, depending on the species) near raptor nesting habitat. The size of the restrictive radius and the timing restriction may be modified depending on species of raptor and whether or not the nest is within the line of site to construction activities. No active raptor nests were located on the BCPA during 2001. An artificial ferruginous hawk nest is present on the pod. If active raptor nests are located on the project area in future years, appropriate avoidance and mitigation measures would be taken to avoid adverse impacts to breeding raptors.

4.7.1.2 Alternative A - No Action

Impacts resulting from the implementation of this alternative would be similar to those described under the Proposed Action, but of a lesser magnitude.

4.7.2 Mitigation

Given the implementation of the mitigation and avoidance measures outlined in this document, the adherence to existing management direction, and the additional measures that were presented within the discussions for the Proposed Action, significant impacts to wildlife are not expected.

4.7.3 Residual Impacts

Although the potential impacts associated with the Proposed Action would be minor, the effects of some would persist until they were off-set over time. Such effects would include the: (1) long-term loss of 28.2 acres of crucial winter range for mule deer, and (2) long-term reduction of 6.2

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acres of potential sage-grouse nesting habitat. Construction of new roads may also cause long-term impacts such as increased human disturbance of wildlife near those roads and an increased potential for wildlife/vehicle collisions, poaching, and harassment.

4.8 SPECIAL STATUS PLANT, WILDLIFE, AND FISH SPECIES

4.8.1 Threatened, Endangered, and Proposed for Listing Species of Plants, Wildlife, and Fish

The following species are either threatened, endangered, or proposed for listing under the ESA. These species may have potential to occur on or near the project area and therefore potential impacts to these species caused by the proposed action are considered.

4.8.1.1 Plant Species

No federally listed threatened or endangered plant species are known to occur on or near the BCPA; therefore, implementation of the proposed development would not adversely impact federally listed species.

4.8.1.2 Wildlife Species

Black-Footed Ferret. In Wyoming, white-tailed prairie dog colonies provide essential habitat for black-footed ferrets. Ferrets depend almost exclusively on prairie dogs for food, and they depend upon prairie dog burrows for shelter, parturition, and raising young (Hillman and Clark 1980). If disturbance is going to occur within 50 meters of a prairie dog town with burrow density that is greater than or equal to 8 burrows/acre, then ferret surveys would be conducted prior to disturbance. The prairie dog town located in Section 12 is not expected to be disturbed given the current proposed location of wells (Figure 4-1). The proposed development is not expected to impact black-footed ferrets, provided that avoidance and mitigation measures outlined in this document, the RMP, and the Interim Drilling Policy are implemented.

Canada Lynx. The Canada lynx is not expected to occur on the BCPA because of the lack of suitable habitat, therefore, the proposed action is not expected to impact Canada lynx.

Bald Eagle. Bald eagles typically build stick nests in the tops of large coniferous or deciduous trees along streams, rivers or lakes. This type of habitat is not present on the BCPA, and bald eagles are not known or expected to nest on the pod. Bald eagles may utilize the BCPA during winter months when big game species are more concentrated on winter ranges. However, the BCPA does not support concentrated use by bald eagles and bald eagle use of the pod is likely incidental. Bald eagles may feed on road-killed carrion in the general vicinity of the pod and workers should be educated about the danger of striking a bald eagle with a vehicle along the main highways and roads providing access to the BCPA (especially Wyoming Highway 789). The Proposed Action is not expected to impact bald eagles provided that the avoidance and mitigation measures in this document, the RMP, and the Interim Drilling Policy are implemented.

Mountain Plover. Although ideal mountain plover habitat does not occur in the project area, some areas of potential mountain plover habitat do occur, and these areas may provide limited nesting opportunities. No mountain plover sightings were reported in the WYNDD (2003), and no mountain plovers were observed in the potential habitat areas during surveys conducted in

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2001, 2002, and 2003. A portion of the potential mountain plover habitat would be disturbed with implementation of the proposed action (Figure 4-1). Impacts to mountain plovers would be minimized by avoiding construction activities in suitable plover nesting habitat during the nesting period from April 10 -July 10. The exact location of mountain plover nests may change annually, and mountain plover nest activity status and location must be kept current. For this reason, it is recommended that surveys for mountain plovers be conducted, within areas of potential habitat, prior to any surface disturbance in those areas, according to current mountain plover survey protocol (USDI-FWS 2002). No impacts to mountain plovers are expected provided that avoidance and mitigation measures outlined in this document and the RMP are implemented.

4.8.1.3 Fish Species

The lack of large river habitat within the project area precludes the occurrence of adults of the four species of endangered fish. Additionally, critical habitat has not been established anywhere in Wyoming for any of these species (Upper Colorado River Endangered Fish Recovery Program 1999). Yet, suitable habitat for spawning, age-0, and juveniles of these species may be present in the downstream portion of Muddy Creek or in the Little Snake River, which are both within the greater Atlantic Rim project area. Due to the injection of produced water, this project would not affect the hydrography of the Colorado River system, and therefore the water quantity needed for these fish.

Colorado Pikeminnow. Although one adult was collected from the Little Snake River in Carbon County, Wyoming in 1990, subsequent survey attempts to collect Colorado pikeminnow from this area of the Little Snake River by WGFD personnel failed to yield any other specimens (Baxter and Stone 1995). Although Muddy Creek and the Little Snake River may potentially support this species of fish at certain times, the current absence of this species downstream from the project area leads to the conclusion that this project would have no impact on this species.

Bonytail and Humpback Chub. Neither of these species has ever been reported within waters of the project area or immediately downstream from this project. However, the Little Snake River and although very unlikely, parts of Muddy Creek may have the potential to provide habitat for both bonytail and humpback chub.

Razorback Sucker. Suitable habitat for this species is not available on the project area and the species is not known from the Little Snake River drainage.

Within Muddy Creek, sediment levels may be elevated during construction of well access roads. Implementing reasonable precautions to limit offsite sediment movement from these areas would prevent substantial increases in sediment loadings in the downstream section of Muddy Creek and downstream from its confluence with the Little Snake River, and would avoid violation of Wyoming Water Quality Standards (WDEQ 1997; 2000). Because the limited water development and usage for this project are predicted to only affect subterranean aquifers related to the coal seams, surface flows would not be affected by water wells developed for this project.

Although occurrence of these endangered fish species has not been confirmed for the Muddy Creek drainage or immediately downstream in the Little Snake River, their probability of occurrence is highly unlikely. If any of these species are identified within the downstream

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portion of Muddy Creek or immediately downstream in the Little Snake River, the BLM should consult with the FWS and develop a protection plan for the fish. Given these precautionary measures, no adverse impacts to any of these species are expected to result from the implementation of the Proposed Action.

4.8.2 Sensitive Plant, Wildlife and Fish Species

4.8.2.1 Plant Species

The occurrence of plant species of concern is likely limited on the BCPA due to a lack of suitable habitat for most of the species. Due to the low likelihood of sensitive plant species to occur on the BCPA and the small amount of disturbance associated with the proposed action, no impacts upon plant species of concern are expected.

4.8.2.2 Wildlife Species

Of the sensitive species listed by the BLM for the RFO area, the species with the highest potential to occur on the BCPA are the burrowing owl, dwarf shrew, white-tailed prairie dog, sage sparrow, Brewer's sparrow, sage thrasher, loggerhead shrike, ferruginous hawk, and the Northern leopard frog. The likelihood of the remaining species, northern goshawk, swift fox, fringed myotis, long-eared myotis, Townsend's big-eared bat, Baird's sparrow, long-billed curlew, white-faced ibis, trumpeter swan, peregrine falcon, boreal toad, and Great Basin spadefoot toad, occurring on the BCPA is low, therefore no impacts upon these species are expected with the Proposed Action. Burrowing owls are typically associated with prairie dog burrows. Burrowing owls may utilize the prairie dog town on the BCPA, however no disturbance is proposed to occur in the prairie dog town; therefore, the proposed development is not expected to impact burrowing owls. No Columbian sharp-tailed grouse leks are located within two miles of the BCPA. Therefore, use of the BCPA by Columbian sharp-tailed grouse would likely be minimal and no impacts are expected with implementation of the Proposed Action. The Wyoming pocket gopher is typically associated with loose gravely soils in greasewood plant communities. Although the Wyoming pocket gopher may be present on the BCPA, the small amount of disturbance associated with the proposed action is not expected to adversely impact the species if it is present. In summary, no serious impacts upon the wildlife species of concern are expected provided that avoidance and mitigation measures in this document, the RMP, and the Interim Drilling Policy are followed.

4.8.2.3 Fish Species

All three of the species (roundtail chub, bluehead sucker, and flannelmouth sucker) are documented to occur within the greater Atlantic Rim Project Area. Thus, suitable habitat for spawning, age-0, juveniles, and adults of these species may be present in the both Muddy Creek and offsite in the Little Snake River, which are both within the greater Atlantic Rim project area. No habitat for these three sensitive fish species occurs on the Brown Cow Pod.

Roundtail Chub. This species is common within the Little Snake River drainage and can also be found in Muddy Creek (Carbon County, Wyoming), a small perennial stream located in the southern portion of the Atlantic Rim project area (Baxter and Stone 1995).

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Bluehead Sucker. This species is known to occur downstream from the proposed project area in the Little Snake River. Population sampling results conducted by BLM in 2000 and 2001 indicate the species is present, but rare, in Muddy Creek.

Flannelmouth Sucker. This species is known to occur in Muddy Creek and downstream in the Little Snake River (Baxter and Stone 1995).

If measures to prevent downstream sedimentation are implemented to prevent offsite movement of fluid spills or disturbed soils caused by construction activities under the Proposed Action (WDEQ 1997; 2000), implementation of the Proposed Action is not likely to adversely effect BLM sensitive fish species in either Muddy Creek or downstream in the Little Snake River. Implementation of reasonable precautions to limit offsite sediment movement should prevent violations of Wyoming Water Quality Standards (WDEQ 1997; 2000). Further, to avoid depletion of Muddy Creek and Little Snake River surface flows, and subsequent adverse impacts to these species due to surface or near surface water removals for well site use, water will be drawn from deep aquifer wells. Given these precautionary measures, implementation of this alternative is not likely to adversely effect the roundtail chub, bluehead sucker, or flannelmouth sucker.

4.8.3 Alternative A - No Action

Impacts to special status plant, wildlife, and fish species under the No Action alternative would be similar to the Proposed Action but of a lesser magnitude.

4.9 RECREATION

4.9.1 Impacts

4.9.1.1 Proposed Action

Impacts to recreation would involve temporary displacement of some hunters, particularly during construction and drilling. Some hunters perceive these activities as displacing game species and creating an environment that detracts from the hunting experience. Displacement could be highest during pronghorn season, but the proposed drilling schedule would limit displacement to one season. Hunters could relocate to other hunting areas near the BCPA.

Undisturbed landscapes, isolation and solitude are often important to non-consumptive users such as photographers and back packers. Project related disturbances that adversely impact the characteristic landscape could also contribute to a decline in the recreation experience for these users. There may be some displacement of these users to more pristine landscapes such as the Adobe Town Wilderness study area. The recreation experience for those continuing to use the area would be less satisfying than use under the pre-disturbance conditions described in Chapter 3.

The affects described above would diminish substantially once drilling and construction were completed. However, they would persist at reduced levels. Patterns of game use and population densities may change as a result of the project. Some long term displacement, permanent or relocation, of hunters and non-consumptive users would result from the project. Further, there may be reduced levels of satisfaction for those recreationists who might continue

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to use the area. Overall impacts to the recreation resource would not be serious due to the short term nature of drilling and construction activities, concentrated locations of activities, and small number of recreationists affected.

4.9.1.2 Alternative A - No Action

Under the No Action alternative the status of the recreation resource as described in Chapter 3 would persist or change moderately depending on the approval of individual wells. No substantial impacts would be expected.

4.10 VISUAL RESOURCES

4.10.1 Impacts

4.10.1.1 Proposed Action

As noted in Chapter 3, Affected Environment, the BCPA is not pristine. Several off-road vehicle tracks exist throughout the area used occasionally by ranchers, recreationists and mineral developers.

Short term impacts to the visual resource associated with construction and drilling in the BCPA would include contrasts in line, form, color, and texture. These contrasts would be associated with drilling rigs, construction equipment, service trailers and the general industrial character of drilling activities. Additional impacts may occur from fugitive dust produced by construction activities.

As a result of terrain and elevation, only a small portion of the BCPA would be visible from Wyoming State Highway 789. Drill rig masts located on western edges of buttes and ridges may be visible during drilling operations. Other than these temporary, middle-ground visual impacts, potential reviewers of the contrasts described above would be few in number and would include hunters and other recreationists, ranchers, and oil and gas field workers.

In the BLM's VRM rating system, the severity of impact is related to the scenic quality, sensitivity level, and distance zone of the affected environment. In general, short term impacts would be most severe where the level of contrast is high and highly visible to potentially large numbers of viewers.

The short term impacts of drilling and field development would exceed the level of contrast permitted in Class 3 areas; however, because the contrasts would be seen by relatively few viewers and would be short in duration, they would not be considered serious.

Permanent production facilities, as described in Chapter 2, would remain once well drilling activities were completed. The presence of permanent production facilities would have continued impacts in the long term.

These facilities would create contrasts in line, form, color, texture and overall pattern in the landscape and would remain for the duration of the project. Fugitive dust impacts as part of on-going operations would also persist. However, as noted for short term impacts, these contrasts would not be visible to many viewers. With appropriate mitigation, the level of contrast would

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not exceed Class 3 standards. Levels of contrast could, however, detract from the experience of those recreating in the immediate area.

Additional fixed facilities such as access road (improved and unimproved roads) would be required to service production facilities. Roads would create additional contrasts in line, color and texture to those described above. With appropriate mitigation, the level of contrast would not exceed Class 3 standards. However, contrasts could diminish the experience of motorists and recreationists.

4.10.1.2 No Action

Under the No Action alternative the status of the visual resource would remain similar to that described in Chapter 3, depending on the number of individually approved wells and ancillary facilities. No substantial impacts would be expected.

4.11 CULTURAL RESOURCES

4.11.1 Impacts

4.11.1.1 Proposed Action

Direct impacts would primarily result from construction related activities. Activities considered to have the greatest effect on cultural resources include blading of well pads and associated facilities, and the construction of roads and pipelines. Sites located outside the BCPA would not be directly affected by the construction activities. If the area of the site crossed by earth disturbing activities does not possess the qualities that contribute to the eligibility of the site, the project is judged to have no effect. Another direct impact would be the visual impact on sites that are eligible under criteria A, B, or C. Setting is a factor for determining eligibility under these criteria and any alteration to the setting may impact eligibility and /or contributing segments.

Indirect impacts would not immediately result in the physical alteration of the property. Indirect impacts to prehistoric sites primarily would result from unauthorized surface collecting of artifacts which could physically alter the sites. At historic sites this could include bottle collecting and the introduction of visual impacts.

Contributing segments of historic trails would be avoided by a ¼ mile buffer zone or outside the visual horizon, whichever is closer. These actions are designed to provide protection for the historic trail corridors.

Cultural surveys have been completed in the BCPA, as required by the Interim Drilling Policy. Identification of important sites prior to disturbance would minimize impacts to cultural resources. The likelihood exists that buried sites could be disturbed during construction. Implementation of measures described in Chapter 2 would reduce impacts and minimize the loss of information.

4.11.1.2 No Action

Under this alternative, impacts to cultural resources would be similar to those described above,

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but of a lesser magnitude.

4.11.2 Mitigation

Decreasing the heights of tanks and painting tanks a color compatible with the local environment could reduce visual impacts to sites eligible for the NRHP under criteria A, B, or C.

4.12 SOCIOECONOMICS

4.12.1 Impacts

4.12.1.1 Proposed Action

Socioeconomic Impacts of the Proposed Action would be largely positive. The project would enhance regional economic conditions and generate local, state and federal government tax and royalty revenues. The relatively small, short-term drilling and field development workforce would not generate serious demand for temporary housing or local government services. Successful implementation of the produced water re-injection program could help avoid community dissatisfaction with the Proposed Action.

4.12.1.1.1 Economic and Employment Effects

The Proposed Action as described in Chapter 2 of this assessment would involve the drilling of 12 CBM wells, two or three produced-water injection wells, gathering and compression systems and other field infrastructure.

CBM drilling typically requires two shifts of 5 workers, an engineer and a mechanic. Completion crews are similarly sized. Leases in the Brown Cow pod are held by two operators, consequently several contractors could be drilling at one time. In addition, electric power lines, gas and produced-water gathering systems and other infrastructure would require construction crews. These activities would be temporary in nature, involving small crews working in the area for a matter of days or weeks. Given the relatively well-developed oil and gas service industry in Carbon and Sweetwater counties, construction crews are likely to be locally-based.

As discussed above, development and operation of the Proposed Action would require goods and services from a variety of local and regional contractors and vendors, from the oil and gas service industry and from other industries. Expenditures by the proponent for these goods and services, coupled with employee and contractor spending, would generate economic effects in Carbon County, southwest Wyoming and the nation as a whole.

The recent Jack Morrow Hills Coordinated Activity Plan (US BLM 2003), estimated that the drilling phase of a CBM well would result in an average of \$143,000 in direct expenditures, not including completion and field infrastructure costs. Including secondary spending, the drilling phase of each well would result in an estimated \$194,000 in total economic impact in southwest Wyoming including \$30,000 in earnings per well and the equivalent of one-full time job on an annual basis, considering the related direct and indirect employment (all estimates in inflation-adjusted \$2001 dollars). Note that although each well would require a larger number of direct drilling and completion workers, these workers would be employed for only a few days on each well.

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Based on these estimates, the 12 well drilling program would involve an estimated \$3.4 million in direct expenditures, which would generate an estimated \$4.7 million in total economic activity in southwest Wyoming, including \$700,000 in earnings associated with the equivalent of 24 direct and indirect jobs. Although cost estimates are not available for completion and field development, the economic activity, earnings and employment of these activities could be equal to or greater than those associated with the drilling phase.

Economic effects of the production phase of CBM development have not been specifically analyzed for southwest Wyoming, however, research conducted for the Southwest Wyoming Resource Evaluation (UW 1996) and updated for the Jack Morrow Hills Coordinated Activity Plan (US BLM 2003) estimated the effects of natural gas production on the southwest Wyoming economy. This research based on averaged and inflation-adjusted (\$2001) US Department of Energy forecasts for natural gas sales prices, estimated that each MMCF of natural gas produced would generate \$2,793 in total economic impact in southwest Wyoming, including \$188 in earnings and 0.005387 annual job equivalents (direct and indirect).

Based on these estimates, per well gross reserve estimates, and assuming all wells are productive, the Proposed Action would result in an estimated \$67 million in revenues from natural gas production over 15 years. This would include an estimated \$66.8 million in total economic impact in southwest Wyoming, including \$4.5 million in earnings associated with an annual average of 9 jobs.

These estimates may change as information about employment, infrastructure and maintenance requirements and other economic effects of CBM production in southwest Wyoming becomes available.

4.12.1.1.2 Carbon County Oil and Gas Activity

Successful completion of the Proposed Action would slightly increase natural gas production in Carbon County, particularly during the first several years of production. For example, the Proposed Action would result in an estimated 3.9 MMCF of methane during the second year of production. This is almost four percent of total 2002 Carbon County natural gas production. Natural gas production associated with the Proposed Action is anticipated to decrease each year thereafter (see Figure 4-2).

In 2002, a total of 199 APD's were issued for Carbon County. If this level of drilling activity were to remain constant, the 12 wells associated with the Proposed Action would increase the 2000 APD level for the county by about 6 percent.

4.12.1.1.3 Effects on Economic Activities in the Vicinity of the Proposed Action

As outlined in Section 3.11, economic activities occurring in the vicinity of the Proposed Action include other oil and gas exploration, grazing, and recreation, primarily hunting.

Properly performed, the pre-construction planning and coordination activities outlined in Section 2 would avoid economic effects on other oil and gas interests in the vicinity of the Proposed Action.

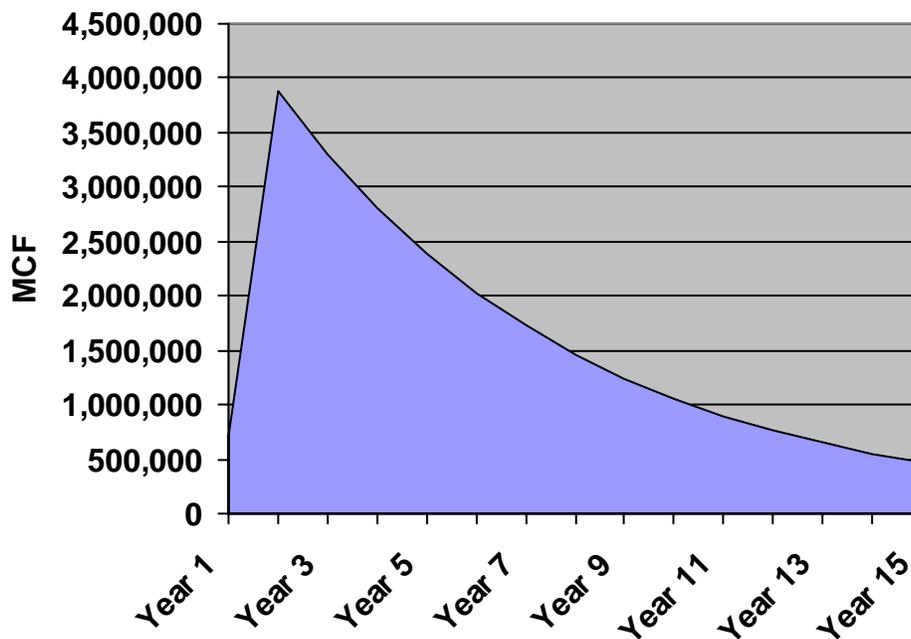
Economic effects on grazing activities would include losses of forage due to temporary and

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long-term disturbance. As described in Section 4.6, temporary disturbance would result in the minor loss of AUMs. If these AUMs are not replaced in other allotments, the associated economic activity in Carbon County would also be lost. Given that these losses are relatively small and may be relocated to other areas, economic effects on grazing are anticipated to be minimal.

According to the recreation analysis conducted for this assessment (see section 4.8), some hunters and other recreationists may be temporarily displaced from the area associated with the Proposed Action during drilling and field development, and perhaps a lesser number during project operations. The effects of the Proposed Action on the Carbon County hunting and recreation economy are anticipated to be minimal, given the short term nature of the drilling and field development period, the relatively few hunters and recreationists who use the area and the potential that hunter's and recreationists may use other areas within Carbon County during this period.

Figure 4-2. Projected Proposed Action-Related Total Annual Gas Production.



Source: Sun Dog EA

4.12.1.1.4 Population Effects

Population effects of the Proposed Action would be minimal. Most of the skills and services required for the Proposed Action are available in the local and regional labor pool, although the recent increase in both conventional and CBM drilling activity in southwest Wyoming has absorbed much of the available oil and gas service workforce. A portion of the short-term demand for drilling workers may be filled by contractors from other areas of Wyoming (e.g., the Powder River Basin), but most field development workers are likely to be drawn from the local

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or regional pool of workers and contractors (Little Snake River Valley, Rawlins, Wamsutter, Rock Springs and Craig). Given the short duration of the drilling phase (6 to 12 months), most non-local workers would be likely to relocate to Carbon County single status, i.e., without family members.

Given the relatively small workforce and short-term nature of the drilling and field development phase of the Proposed Action, it is likely that area businesses would accommodate the increase in economic activity with existing employees. For the operations phase, it is assumed that an annual average of nine job equivalents (direct and indirect) would be created in southwest Wyoming by the Proposed Action. Additionally, many of these jobs would be filled from the local labor pool, consequently, the population associated with the operations phase of the Proposed Action would be minimal.

4.12.1.1.5 Temporary Housing Demand

The relatively small Proposed Action-related demand for temporary housing during drilling and field development would be accommodated by existing temporary housing resources. Demand may be accommodated in Baggs, Rawlins, Rock Springs and/or Craig, depending on seasonal considerations and other oil and gas industry activity.

4.12.1.1.6 Law enforcement and Emergency Response

The relatively small level of field development and operations activity would be accommodated by existing law enforcement and emergency management resources.

4.12.1.1.7 Fiscal Effects

The Proposed Action would generate tax revenues including:

- € local ad valorem property taxes on production and certain field facilities;
- € sales and uses taxes to the State of Wyoming, Carbon County and its incorporated municipalities;
- € mineral royalties to the federal government, a portion of which are returned to the State and local governments; and,
- € state severance taxes.

Ad valorem and severance taxes and federal mineral royalty estimates are based on \$2.81/MCF DOE EIA gas price forecasts, averaged and adjusted for inflation (\$2001).

4.12.1.1.7.1 Ad Valorem Taxes

The Proposed Action would generate ad valorem property tax to Carbon County, the Wyoming School Foundation Fund, Carbon County Schools and various taxing districts within the county. Ad valorem taxes would be generated from two sources: 1) the fair market value of methane produced and sold; and 2) the value of certain capital facilities within the well fields (all underground facilities associated with wells are exempt by state statute).

Constant Carbon County mill levies were assumed in the preparation of these estimates. In reality some mill levies are set each year by the Carbon County Commissioners, officials of the

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various special and school districts or the State; some change each year. Mill levies reflect the revenue needs of the taxing entity and estimates of assessed valuation within the entity. Natural gas is assessed based on the previous year's production, therefore the revenues associated with these levies would be received the year following these estimates.

According to estimates provided by the proponent, gas production in the BCPA would peak in the second year of production and decline thereafter over the 15 year projected life of the project. Consequently, production-related ad valorem property tax revenues associated with the Proposed Action would be highest in the third year of production, and diminish annually thereafter. Under the assumptions described above, ad valorem tax revenues from production and facilities would total \$4.1 million over the 15 year life of the project, including about \$800,000 for the county and its districts based on 12 mills, \$67,000 to the weed and pest district based on 1 mill, \$3 million for schools based on 45 mills (12 for the State School Fund, 6 for the countywide school levy and 27 for the school district levy and other school taxes) and \$243,000 for a variety of special districts (museum, cemetery, water conservancy and conservation) based on levies totaling 3.42 mills.

Table 4-1 Estimated Ad Valorem Property Tax Revenues Tax over the 15- year life of the Proposed Action

Carbon County (12 mills)	Weed & Pest (1 mill)	Total Schools (45 mills)	Special Districts (3.42 mills)	Total
\$800,000	\$67,000	\$3,000,000	\$243,000	\$4,100,000

Source: Blankenship Consulting LLC based on production estimates. All estimates rounded.

4.12.1.1.7.2 Federal Mineral Royalties and Wyoming Severance Taxes

The federal government collects a 12.5 percent royalty on the fair market value of gas produced from federal leases, less production and transportation costs. Half of mineral royalty revenues are returned to the state where the minerals were produced. In Wyoming, a portion of the state's share is distributed to local governments and to the Wyoming School Foundation Fund. Actual Mineral Royalty revenues collected would vary based on actual production levels, gas sales prices, and production and transportation costs.

Table 4-2. Estimated Federal Mineral Royalties and Severance Tax over the 15- year life of the Proposed Action

Federal Mineral Royalties	Wyoming Severance Tax
\$7,266,000	\$3,051,000

Source: Blankenship Consulting LLC based on production estimates. All estimates rounded.

The State of Wyoming collects a six percent severance tax on the fair market value of natural gas produced within the state. Federal mineral royalty payments and production and transportation costs are exempt from this tax. The state uses revenues from this fund for a variety of purposes (e.g., General Fund, Water Development Fund, Mineral Trust Fund, and Budget Reserve) and returns a portion to counties and municipalities. Estimated severance tax revenues are displayed in Table 4-2. Actual severance tax revenues would vary based on actual production levels, gas sales prices, and production and transportation costs. Actual

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severance tax revenues may be less than these estimates if a portion of the gas is used for production purposes.

4.12.3.1.7.3 Sales and Use Tax

Wyoming levies a four percent sales and use tax on the gross receipts of tangible goods and certain services (drilling services are exempted). The state returns 28 percent of the revenue (less administrative costs) to the county and municipalities where the taxes were collected. Carbon County also levies a one percent local option sales and use tax which is distributed to the county and its municipalities.

During the field development phase of the Proposed Action, an estimated \$3.4 million would be spent for goods and services subject to state and local sales and use taxes. This amount would generate about \$59,000 for the State of Wyoming and about \$43,000 for Carbon County and its municipalities.

4.12.1.1.8 Local Attitudes and Opinions

The 1996 resident survey conducted for the Carbon County Land Use Plan (discussed in Section 3.11.6) did not specifically address CBM development, but it provides a basis for assessing attitudes and opinions about issues associated with the Proposed Action. For example, it is reasonable to assume that survey respondents would have similar attitudes about CBM development activities that are similar to traditional natural gas development activities (i.e., seismic exploration, drilling, field development and production).

However, the importance that survey respondents placed on water conservation and the availability of water to support future land use suggests that the produced water aspects of CBM development could be of concern to them. Successful implementation of the produced water re-injection program described in Section 2.1.3.4.2 should mitigate those concerns.

According to the Carbon County Land Use plan, resident response to the survey suggests “a need to balance the conservation of natural resources and the economic viability of resource-based industries in the county.” This sentiment coupled with partial support for leasing more federal lands for oil and gas development (about 50 percent countywide, somewhat higher in every community but Rawlins and Saratoga) suggests that development of CBM resources would be generally supported by residents of the Little Snake River Valley, as long as they perceive that such development does not damage water resources or wildlife habitat, or degrade the quality of recreation resources in the area. The conclusions of the analyses conducted for this assessment are that impacts to water, wildlife and recreational resources would not be serious. If these conclusions are correct, the Proposed Action should not generate high levels of dissatisfaction among Carbon County residents. Conversely, if unanticipated impacts to water resources, wildlife habitat or recreation resources occur, resident dissatisfaction with the Proposed Action could be high.

4.12.1.1.9 Environmental Justice

The Proposed Action would not directly affect the social, cultural, or economic well-being and health of minorities or low income groups. The BCPA is relatively distant from population centers, so no populations would be subjected to physical impacts from the Proposed Action.

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4.12.1.2 No Action

Implementation of the No Action alternative would result in socioeconomic conditions similar to those described in Section 3.11, unless other oil and gas development occurs in the vicinity of the Proposed Action.

4.13 TRANSPORTATION

4.13.1 Impacts

4.13.1.1 Proposed Action

4.13.1.1.1 Federal and State Highways

The Proposed Action would generate increases in traffic volumes on highways providing access to the project area and on county and operator-maintained roads within the project area. These increases would result from the movement of project-related workers, equipment and materials to and from the project area to perform drilling, field development, well service, field operations and reclamation activities.

Table 2-1 in Chapter 2 shows the estimated average number of trips associated with various well field activities. According to information provided by the proponent, drill rigs, water trucks and other items of heavy equipment would be transported to the BCPA and remain within the project area until drilling is completed. Materials and supplies would be delivered on a weekly basis and stockpiled within the project area at a staging area. Drilling and completion crews and other personnel would commute to the project area daily, except for drilling engineers who would stay at a trailer within the at the drill site during the workweek. Based on these plans and the estimates contained in the table, the Proposed Action would generate between 15 to 20 round trips per day over the drilling and field development period. After the drilling and field development phase is completed, Proposed Action-related traffic would average one or two trips per day, with slightly higher peak periods when maintenance activities are performed on wells and facilities.

Based on these assumptions and estimates, the incremental increase in area traffic associated with the Proposed Action would not result in a noticeable deterioration of level of service for I-80 or SH 789 (Rounds 2000).

Given the relatively small increment of traffic and the relatively short duration of the drilling and field development phase, it is unlikely that the Proposed Action would result in a measurable increase in accident rates on federal and state highways; during the operations phase, the probability of an increase in accident rates attributable to the Proposed Action is negligible.

4.13.1.1.2 BLM Roads

The Proposed Action would result in increases in traffic on BLM Rd. # 3309. The relatively small, short-term increases in traffic are unlikely to result in noticeable deterioration of this road or substantial increases in accidents. The primary effect of Proposed Action-related traffic on BLM Rd. # 3309 would be to accelerate road maintenance requirements

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Increased traffic would generate an increased in the potential for vehicle/stock accidents, although the slower speeds required by the condition of county roads tend to minimize the frequency of such accidents (Warren 2000). Coordination with livestock operators during sensitive periods (e.g., cattle movements and calving season) could further reduce potential for vehicle/stock accidents.

4.13.1.1.3 Internal Roads

Section 2.1.2.1 (Access Road Construction) describes the measure proposed by the proponent to develop the transportation network necessary to access wells and ancillary facilities within the BCPA. Based on these proposals, an estimated 2.3 miles of new roads would be constructed within the project area. The proponent would be responsible for constructing and maintaining new and improved roads within the project area, therefore no fiscal impacts are anticipated for the BLM.

4.13.1.2 Alternative A - No Action

Implementation of the No-Action alternative would result in transportation conditions similar to those described in Section 3.12, unless other oil and gas leases are developed.

4.14 HEALTH AND SAFETY

4.14.1 Impacts

4.14.1.1 Proposed Action

Health and safety impacts of the Proposed would include a relatively low risk to project workers from industrial accidents, firearm accidents and natural disasters. There would be a slight increase in risk of traffic accidents and range fires for the general public during drilling and field development and a negligible increase during field operations.

Occupational Hazards

Two types of workers would be employed by the Proposed Action: oil and gas workers, who had a 1998 annual accident rate of 4.0 per 100 workers, and special trade contractors, who had a non-fatal accident rate of 8.9 per 100 workers (U.S. Department of Labor, Bureau of Labor Statistics 1998). These rates compare with an overall private industry average for all occupations of 6.2 per 100 workers.

There has been recent concern among CBM drillers that worker safety standards and training used for conventional oil and gas activities may not be appropriate for the CBM industry (Rock Springs Rocket Miner 2001). During 2000, five workers died and six others were seriously injured in CBM-related accidents in Campbell County, Wyoming. The Wyoming Occupational Health and Safety Administration, Worker's Safety Division (OHSA) is meeting with CBM company officials to consider changes in worker safety standards and revised training requirements.

During the drilling and field development phase of the project the statistical probability of injuries

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is low. During field operations, the annual statistical probability of injuries is minimal, given the low level of employment.

The US BLM, OSHA, USDOT and Wyoming OGCC and OHSA each regulate certain safety aspects of oil and gas development. Adherence to relevant safety regulations on the part of the Proponent and enforcement by the respective agencies would reduce the probability of accidents. Additionally, given the remote nature of the project area, and the relatively low use of these lands by others (primarily grazing permittees and hunters), occupational hazards associated with the Proposed Action would mainly be limited to employees and contractors rather than the public at large.

Pipeline Hazards

Increasing the miles of gathering line within the analysis area would increase the chance of a pipeline failure. Accidents rates for gas transmission pipelines are historically low. Nationwide, injuries associated with gas transmission pipelines averaged 14 per year from 1990 through 1996, fatalities averaged one per year and incidents such as ruptures averaged 79 per year (U.S. Department of Transportation 1998). Therefore, the relatively small amount of new pipeline associated with the Proposed Action, coupled with the low probability of failure and the remoteness of the project area would result in minimal risk to public health and safety. Signing of pipeline rights-of-way could reduce the likelihood of pipeline ruptures caused by excavation equipment--particularly in the vicinity of road crossings or areas likely to be disturbed by road maintenance activities.

Other Risks and Hazards

Highway safety impacts are discussed in Section 4.12 (Transportation). Sanitation and hazardous material impacts would be avoided or reduced by the implementation of the mitigation measures outlined in Section 2.1.7.2.16.

The potential for firearms-related accidents would occur primarily during hunting season. During this season the substantial activity in the project area would encourage hunters to seek more isolated areas thus reducing the potential for accidents. During operations, the relatively few personnel on site would result in minimal risk of firearms-related accidents.

The risk of fire in the analysis area would increase under the Proposed Action. This is an unavoidable impact associated with construction activities, industrial development and the presence of fuels, storage tanks, natural gas pipelines and gas production equipment. However, this risk would be reduced by the placement of facilities on pads and locations that are graded and devoid of vegetation which could lead to wildfires. In the event of a fire, property damage most likely would be limited to construction or production related equipment and range resources. Fire suppression equipment, a no smoking policy, shutdown devices and other safety measures typically incorporated into gas drilling and production activities would help to minimize the risk of fire. There would be a heightened risk of wildfire where construction activities place welding and other equipment in close proximity to native vegetation. Given the limited public use and presence in the project area, the risk to the public would be minimal. There would be a small increase in risk to area fire suppression personnel associated with the Proposed Action.

Based on the foregoing assessment, risks to public health and safety should only minimally

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increase as a result of the Proposed Action.

4.14.1.2 Alternative A - No Action

Under the No Action alternative, health and safety risks would remain essentially as they are at the time of this assessment, unless other oil and gas leases within the area are developed.

4.15 NOISE

4.15.1 Impacts

4.15.1.1 Proposed Action

Noise associated with drilling, construction and natural gas production operations can create a disturbance that affects human safety (at extreme levels) or comfort as well as modifies animal behavior. Determining activities that exceed the maximum standards is not a simple issue since perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening/focusing by topography or vegetation, and distance to the observer. Noise levels in excess of the 55 dBA maximum standards can occur at construction and production operations. Under typical conditions, excess levels decline below the level of significance (55 dBA) at 3,500 feet from the source (BLM 1991). Construction and drilling -related impacts would be short-term, lasting as long as activities were ongoing at well sites, access roads, pipelines, and other ancillary facilities such as compressor sites. Noise would be created over a longer term at the individual well sites as a resulting of drilling activities.

Given the low human population densities in the project area, construction and development operations under the Proposed Action would be sufficiently distant from residences that none would likely be affected by construction or development operations. Overall noise produced by construction and support services equipment during peak activity periods would be moderate because of the dispersed and short-term nature of these activities.

4.15.1.2 No Action

Implementation of the No Action Alternative would not add to existing noise levels within the BCPA, except for noise associated with wells and ancillary facilities approved on a case-by-case basis.

4.15.2 Mitigation Summary

The BLM may require that noise levels be limited to no more than 10 dBA above background levels at sage grouse leks.

4.15.3 Residual Impacts

Where indications are that noise levels are above 10 dBA at lek locations, the implementation of the mitigation measures should minimize the impact of noise from production facilities on strutting sage grouse.

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4.16 CUMULATIVE IMPACTS

Cumulative impacts are those that would result from the incremental impacts of the Proposed Action when added to past, present, and reasonably foreseeable future actions (RFFA's). Reasonably foreseeable development is that development likely to occur within the BCPA, or cumulative impact assessment area (CIA) within the next 5 years. CIA areas vary between resources and are generally based on relevant landscapes, resources, projects, and/or jurisdictional boundaries.

The only major resource development currently proposed near the project area is the exploration activity allowed under the Interim Drilling Policy for the Atlantic Rim Coalbed Methane area. The interim drilling policy allows a maximum of 200 coalbed methane wells within the Atlantic Rim project area, for research and exploratory purposes, during the interim period in which the Atlantic Rim EIS is prepared. Wells will only be allowed in the nine pods the operators have proposed and a maximum of only 24 coalbed methane wells will be allowed within any pod, regardless of multiple zones to be evaluated. Surface-disturbing activities for these 200 wells may affect an estimated 650 acres, including an estimated 60 miles of new road access (new roads associated with the interim drilling program will likely be in the form of spur roads from the existing road network) and an estimated 100 miles of water and gas flowlines. If productive, and following reclamation, long-term disturbance associated with the 200 well interim drilling program would likely affect an estimated 200 acres for the LOP. Total distance between Pod 1 and Pod 9 is about 40 miles. The distances between the individual pods vary, from 1 ½ miles between pods 2 and 3, to over 6 miles between pods 7 and 8 (see Figure 1-2). The Brown Cow pod is Pod #8 of the 200 well interim drilling program.

Past or existing actions on or in the vicinity of the BCPA that continue today and have major influences on the area include the road network; oil and gas wells; ranching/livestock facilities (i.e. fences, stock watering facilities, ranch houses, power lines, a pipeline etc.); and previously approved CBM wells and associated facilities.

The CIA area for soils, vegetation and wetlands, and water resources is the 219,500-acre portion of the Muddy Creek Watershed which overlaps the Atlantic Rim project area. To date, 109 wells have been drilled within this area. Of that total, 59 oil and gas wells have been plugged and abandoned and are probably within various stages of reclamation; 37 oil and gas wells are in various stages of completion, resulting in approximately 337 acres of long-term disturbance (related facilities disturbance included); and 13 CBM and water injection wells, and related facilities, have been drilled, resulting in approximately 13 acres of long-term disturbance. Pods 5, 6, 7, and 8 of the interim drilling program are located within this CIA area and would account for approximately 93 acres of additional long-term disturbance. The existing disturbance of 359 acres resulting from current oil and gas activities, added to the approximate 93 acres associated with the four pods under the 200 CBM well interim drilling program proposed for the Atlantic Rim area totals 452 acres (0.2 percent) of long-term oil and gas related disturbance within the 219,500-acre Muddy Creek CIA area.

Table 4-3 provides a summary of the cumulative impacts analysis requirements for each of the resource values in the other eight pods associated with interim development in Pod 8.

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Table 4-3. Cumulative Impacts Analysis Matrix - Cumulative Impacts Associated with the Brown Cow Pod.

RESOURCE VALUE	POD1	POD2	POD3	POD4	POD5	POD6	POD7	POD9	DISCUSSION
Geology	X	X	X	X	X	X	X	X	All wells completed in the Almond Formation of the Mesaverde Group
Air Quality	X	X	X	X	X	X	X	X	All in Laramie Air Basin
Soils	O	O	O	O	X	X	X	O	Limit impact discussion to the Muddy Creek CIA area
Surface water	O	O	O	O	X	X	X	O	Pod 8 located in Muddy Creek CIA area; Pod 8 would have no impacts to other watersheds
Ground water	X	X	X	X	X	X	X	X	Production of ground water for all pods from Almond Formation
Vegetation	O	O	O	O	X	X	X	O	Limit impact discussion to the Muddy Creek CIA area
Range Resources	O	O	O	O	X	X	O	O	Pods 5, 6, 7 in the Doty Mountain Allotment
Wildlife	X	X	X	X	X	X	X	X	Sage grouse habitat in all pods, no drilling within 1/4 mile of leks & within sage grouse crucial wintering areas. No drilling in prairie dog towns that meet the requirement for potential t black-footed ferret (BFF) habitat without a BFF survey
Crucial WR	X	X	X	X	X	X	X	X	Pod 7 pronghorn CWR; Pods 8 & 9 mule deer CWR
Recreation	X	X	X	X	X	X	X	X	Minimal displacement of hunters & recreationists
Visual	X	X	X	X	X	X	X	X	Minimal displacement of recreationists
Cultural	O	O	O	O	O	O	O	O	Block surveys required in each pod, with additional mitigation; no cumulative relationship
Socioeconomic	X	X	X	X	X	X	X	X	All pods within the same socioeconomic area
Transportation	X	X	X	X	X	X	X	X	Increased traffic
Health and Safety	X	X	X	X	X	X	X	X	Major related health and safety issues related to travel
Noise	O	O	O	O	O	O	O	O	Localized affect on wildlife

X - Discussed in the EA; O - Not discussed in the EA (no cumulative relationship)

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4.16.1 Geology/Minerals/Paleontology

Existing, proposed, and reasonably foreseeable actions would not affect landslide deposits and would be unlikely to trigger geologic hazards such as landslides, mudslides, debris flows, or slumps, no incremental increase in cumulative impacts associated with geologic hazards would occur. If the terms of the interim drilling policy are followed and proper well pad and facility siting, construction, and reclamation techniques are used the cumulative impacts to the surface geologic environment would be minimized. Proposed and RFFA's would require the restoration of disturbed lands to predisturbance conditions and as such would minimize topographic alterations. Standard stipulations and project- and site-specific construction and reclamation procedures would be required for additional development on federal lands and these measures would further minimize cumulative impacts of surface geologic environment.

With the exception of CBM, no major surface mineral resources would be impacted by the implementation of the RFFA's. Protection of subsurface mineral resources is provided by the BLM casing and well bore cementing policy.

No cumulative adverse impacts are expected to occur to potential fossil resources beyond those discussed in Section 4.1.1.1 as a result of the Proposed Action in combination with existing, proposed, and reasonably foreseeable actions. Adoption of mitigation measures prescribed in that section could foster cumulative beneficial impacts of the project by either resulting in the discovery of new fossil resources or providing paleontologists with evidence of absence of such resources in the area.

4.16.2 Air Quality

Cumulative impacts from emissions resulting from the implementation of past oil and gas projects and the proposed 200 well program would be much the same as those found on similar oil and gas projects such as Continental Divide. Emissions from oil and gas facilities approved prior to 1999 were included in the 3,000 well air quality analysis prepared for the Continental Divide EIS, of which only 2,130 wells were approved. The emissions from the 200 well interim drilling program would still be covered under the air quality model completed for the Continental Divide project.

4.16.3 Soils

The CIA area for soils includes the 219,500-acre portion of the Muddy Creek Watershed which overlaps the Atlantic Rim Project Area. Cumulative impacts include soil impacts from on-going exploration and development activities, recently constructed projects, and RFFA's, as described in Section 4.15. Cumulative long-term disturbance of 452 acres would be approximately 0.2 percent of the 219,500-acre Muddy Creek Drainage CIA area. This amount of cumulative impacts upon the soil resources would be minimal, provided that all mitigation and avoidance measures are implemented

4.16.4 Water Resources

The water resources CIA area includes the 219,500-acre portion of the Muddy Creek Watershed, which overlaps the Atlantic Rim Project Area (ARPA). Existing and future disturbance consists of approximately 39.79 acres, or 0.015 percent of the Muddy Creek

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Drainage CIA area. The area of possible water impacts related to the full development of the local watershed containing the Brown Cow pod is 2,977 acres, or 1.4 percent of the CIA area. This cumulative disturbance would minimally impact surface water or groundwater quantity or quality.

The impacts predicted to occur are based upon the current knowledge of the geology, CBM resources, and groundwater hydrology in the area. Both methane and water production rates from future CBM wells, and specifics related to groundwater injection, cannot be accurately predicted. These variables could potentially affect the configuration of field production, gas processing, and gas and water conveyance facilities; however, none of these changes are expected to measurably affect the conclusions presented herein. Federal regulations provide for additional analysis if substantial changes in resource conditions would alter the conclusions reached herein.

Cumulative impacts to surface water resources would be maximized shortly after the start of construction activities, decreasing in time due to reclamation efforts, then stabilizing during the production/operation period when routine maintenance of wells and ancillary facilities takes place. Additionally, all roads, well locations, and facility infrastructure would be regularly inspected and maintained to minimize erosion, sedimentation, and surface water quality impairment.

Impacts to groundwater within the project area are not anticipated. The springs in the area are classic "contact" springs, which result from permeable rocks overlying rocks of much lower permeability. In the ARPA, the permeable Browns Park Formation overlies the less permeable Almond Formation, which is a member of the Mesaverde Group. Water easily percolates through the Browns Park Formation, and is perched on the lower permeability clay and shales of the Almond Formation. Where this contact is exposed by erosion, a line of springs can result. The source of the springs is infiltrating precipitation, and this source would not be removed by pumpage of the underlying coal seams. For these reasons, pumping water from Almond Formation coal seams during exploration drilling within the ARPA would likely have little impact on the ability of these springs to produce water.

Due to thick confining layers, wells completed in water-bearing strata above or below the Almond coal seams are not likely to be impacted. Wells completed in the Almond Formation coal seams in close proximity (less than one mile) to the pod could be impacted. Tritium analysis of groundwater withdrawn from a CBM well in the Brown Cow Pod indicates that groundwater from the Almond Coal seam does not contribute to surface water flows in the Colorado River Basin. Tritium is a radioactive isotope that would be present if water had been deposited after nuclear testing in the 1940s. Tritium is measured in tritium units and would show values of 0.8 or higher if present. Other isotopic analysis has shown the water in these formations was deposited during the last ice age or earlier.

Cumulative impacts to the groundwater resources within the Mesaverde Group would be limited to a temporary decline in hydrostatic head in coal seams within the Almond Formation resulting from development of the Brown Cow pod and subsequent pods associated with the interim drilling program. For purposes of this EA, existing impacts to groundwater resources within the Mesaverde Group resulting from prior development are so limited as to be non-existent.

Current and future oil and gas exploration and development activities in the Project Area must comply with federal and state environmental regulations. Therefore, impacts to groundwater

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quantity or quality on a cumulative scale are not expected. This is particularly true given the fact that wells would be completed in accordance with Onshore Order No. 2 and the recent BLM guidelines that reduce the potential for groundwater contamination.

This pod is development that would be accomplished in the interim period while the Atlantic Rim EIS is being completed. Ground water monitoring wells and drawdown modeling would be completed for the entire Atlantic Rim Project Area, of which the BCPA is a part, during the water resource analysis of the EIS.

4.16.5 Vegetation and Wetlands

The CIA area for vegetation and wetlands includes the 219,500-acre portion of the Muddy Creek Watershed which overlaps the Atlantic Rim Project Area, and encompasses some 219,500 acres. Cumulative impacts includes impacts to vegetation and wetlands from on-going exploration and development activities, recently constructed projects, and RFFA's.

Cumulative long-term disturbance of 7.5 acres would be approximately 0.003 percent of the 219,500-acre Muddy Creek Drainage CIA area. This amount of vegetation loss would be minimal, and no direct impacts of aquatic and riparian areas are expected because current proposed project activities would avoid these areas. Provided that soil erosion mitigation measures are followed, no indirect aquatic and riparian impacts are expected. Cumulative impacts upon both vegetation and wetland resources would be minimal, provided that all mitigation and avoidance measures are implemented.

4.16.6 Range Resources and Other Land Uses

4.16.6.1 Range Resources

Portions of the Blue Sky Pod (7) and Pod 9, and all of the Brown Cow Pod (8), of the 200-well interim drilling program, are located within the Cherokee Grazing Allotment. Based on the known LOP disturbance to the Blue Sky Pod, the proposed disturbance to the Brown Cow Pod, and an average per pod for Pod 9, the total LOP disturbance would be approximately 48 acres, as a result of CBM drilling operations on the three pods. The approximate 48 acres of long-term disturbance equates to a reduction of five AUM's (0.03 percent) from the total of 17,089 available in the Cherokee Grazing Allotment, which would be a minimal impact.

4.16.6.2 Other Land Use

Potential cumulative impacts to other land uses are limited to recreation resources and wildlife habitat, which are discussed under the sections dealing with those resources.

4.16.7 Wildlife

The CIA area varies with species, as indicated within the respective analyses. The disturbance of wildlife habitat resulting from implementation of the interim drilling program of the nine pods would reduce habitat availability and effectiveness for a variety of common mammals, birds and their predators. Initial phases of surface disturbance would result in some direct mortality to small mammals, displacement of songbirds, along with a slight increase in mortality from increased vehicle use in the areas of the nine pods. Due to the relatively high production potential of these species and the relatively small amount of additional habitat disturbed

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(0.003% of the Atlantic Rim project area), small mammal and songbird populations would quickly rebound to pre-disturbance levels following reclamation, and no long-term impacts to these populations are expected.

Activities associated with the construction phase of each of the nine pods in the interim drilling program would likely temporarily displace antelope, mule deer, and elk; however, once construction is completed they would likely habituate and return to pre-disturbance activity patterns. Elk crucial winter/yearlong range does not occur on any of the pods and should not be affected by project activities. Pronghorn crucial winter/yearlong occurs within the Cow Creek Pod (6) and the Blue Sky Pod (7). The proportion of pronghorn crucial winter/yearlong range within the Baggs Herd Unit that would be affected over the short-term and long-term, would be 0.03 and 0.008 percent, respectively. Mule deer crucial winter/yearlong range occurs on the Cow Creek Pod (6), Brown Cow Pod (8) and Pod 9. The proportion of mule deer crucial winter/yearlong range within the Baggs Herd Unit that would be affected over the short-term and long-term, would be 0.05 and 0.01 percent, respectively. Construction activities on crucial winter/yearlong range would be limited to May 1 - Nov 14. Provided that mitigation measures contained in Chapter 2, the Interim Drilling Policy, and the RMP are implemented, cumulative impacts to big game populations within their respective herd units are expected to be minimal.

Greater sage-grouse occupy the area of the nine pods year-round and make seasonal use of the habitats. Approximately 11,000 acres (56 percent) of the total surface area of the nine pods overlap the 2-mile radius of the historical leks in the area. Therefore, approximately 365 (3.3%) and 112 (1.0%) acres of potential sage grouse nesting habitat would, respectively, be affected by short-term and long-term disturbances associated with the production activities. Considering the vast amount of potential nesting habitat available, the 112-acre loss would be minimal. Sage grouse within Sierra Madre Upland Game Management Unit (Area 25) would only be minimally impacted from the cumulative LOP disturbance associated with the proposed action of the nine pods, provided the implementation of the NSO's, interim drilling guidelines, seasonal closures, reclamation, and mitigation measures provided are followed.

Although no active raptor nests were located on the nine pods during 2001 aerial surveys, implementation of protection measures identified in Chapter 2, the RMP, and the Interim Drilling Policy are expected to protect the raptor populations within the interim drilling area. Therefore, only minimal cumulative impacts to raptors within Muddy Creek Watershed are likely to occur.

4.16.8 Special Status Plant, Wildlife, and Fish Species

4.16.8.1 Plant Species

The distribution of plant species of concern is likely limited within the Atlantic Rim area due to a lack of suitable habitat for most of the species. The required application of existing FWS and BLM monitoring and mitigation measures is expected to provide adequate protection for threatened, endangered, and special status plant species. Thus, impacts to Special Status Plant Species are expected to be minimal.

4.16.8.2 Wildlife Species

Acreages and burrow densities that are adequate to support black-footed ferrets (200 or more acres with 8 or more burrows per acre) occur on three of the nine pods on the project area (Cow Creek Pod, Sun Dog Pod, and Blue Sky Pod). No disturbance to the town was proposed in the

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Cow Creek Pod, so black-footed ferret surveys were not required. However, black-footed ferret surveys have been conducted on the other two pods and no ferrets or ferret sign were found. Because of the fact that black-footed ferret surveys are required (per interim drilling guidelines) on all prairie dog towns with proposed development, no impacts to this species are expected as the result of the proposed 200-well interim drilling activities.

The required application of existing FWS and BLM monitoring and mitigation measures is expected to provide adequate protection for threatened, endangered, and special status plant species. Thus, impacts to Special Status Wildlife Species are expected to be minimal.

4.16.8.3 Fish Species

Proposed development in the pods is not expected to result in reductions in BLM sensitive, Threatened, or Endangered adult fish numbers, or their exclusion from, or degradation to their spawning areas within the Muddy Creek watershed or in downstream waters of the Little Snake River. Additionally, permitted disturbances associated with the exploratory CBM pod development and other development within the Muddy Creek watershed would employ erosion control measures and construction techniques suitable to limit offsite soil movement and downstream degradation of fisheries habitat due to sediment inputs. The required application of existing FWS and BLM monitoring and mitigation measures to the proposed CBM interim drilling program is expected to provide adequate protection for threatened, endangered, and special status species. Thus, the cumulative impacts to fish species found within the affected watersheds are expected to be minimal.

4.16.9 Recreation

BLM does not have statistics on historical use of the project area by recreation groups which could be used to determine trends in cumulative impacts on recreation use and displacement. Cumulatively, overall impacts to the recreation resource are expected to be minimal with some temporary displacement of hunters and recreationists during the short-term drilling periods. Some long-term displacement of hunters and non-consumptive users may occur, and there may be reduced levels of satisfaction for those who might continue to use the area.

4.16.10 Visuals

As discussed in Chapter 3, existing visual qualities in the BCPA and adjacent lands have already been affected by ongoing natural gas development, including road building and pipeline construction. Existing, proposed, or reasonably foreseeable development would add to the level of impact to visual resources in the immediate area. The composite experience of those traveling through the area, particularly on back roads, is one of a modified landscape. Contrasts in line, form, color and texture from development activities begin to dominate the viewer's experience. These conditions would increase the likelihood that viewers, particularly back country recreationists, would be dissatisfied with the visual component of their recreation experience. However, the cumulative impact of existing, proposed, or reasonably foreseeable development on visual resources would still be consistent with the current VRM Class 3 designation with implementation of mitigation measures proposed by Merit in Chapter 2, Section 2.1.8.2.11.

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4.16.11 Cultural Resources

Cultural resources on public lands, including archaeological sites and historic properties, are protected by federal law and regulations. Current CBM operations must comply with these protective regulations, and BLM has required the completion of cultural resource inventories prior to surface-disturbing activities. These inventories have been used to identify sites potentially eligible for inclusion on the National Register of Historic Places and to identify sites which BLM has required past exploration and development activities to avoid.

Because Class III cultural resource inventories have been completed on the BCPA, the potential for increased impacts on cultural artifacts would be minimized. By avoiding known cultural and historical sites during the layout of drill sites, access roads, and pipeline corridors, the potential for incremental increases in cumulative impacts would be avoided. Completion of cultural resource inventories would have a beneficial, cumulative impact on the level of cultural information about the project area. Some unintentional damage to subsurface resources could occur during grading or excavation activities. However, implementation of resource protection and mitigation measures described in Chapter 2, Section 2.1.8.2.15 would protect such resources upon discovery.

4.16.12 Socioeconomics

Southwest Wyoming is currently experiencing an increase in the pace and level of natural gas development. Drilling and field development is occurring in areas near the BCPA including Continental Divide/Wamsutter II, South Baggs, Mulligan Draw, Creston/Blue Gap, Hay Reservoir and potentially, Desolation Flats. While this surge in development will result in increased employment, income and tax revenues in the region, it will also result in increased housing demand and increased demand for local and state government facilities and services.

Communities such as Rawlins and Rock Springs are still below peak population levels of the 1980's and have infrastructure and housing to accommodate some population growth. Smaller communities near the BCPA, such as Wamsutter, are struggling to accommodate population growth associated with development of the currently approved natural gas fields identified above.

At the recent pace of development, neither the relatively small, short-term drilling and field development workforce or the minimal operations employment and activity associated with the existing, proposed, or reasonably foreseeable development would add appreciably to cumulative housing and local government service demand in the area.

If the current pace of drilling and field development in southwest Wyoming continues, however, the potential for degradation of the quality of some recreation resources in the area would increase. If Carbon County residents perceive that degradation of recreation resources has occurred, levels of dissatisfaction among some residents and area visitors would correspondingly increase.

4.16.13 Transportation

Increased oil and gas development in western Carbon County and eastern Sweetwater County will result in increased traffic on affected segments of I-80 and WSH 789. The condition of these highways is adequate to accommodate existing levels of traffic and some increases

CHAPTER 4: ANALYSIS OF ENVIRONMENTAL CONSEQUENCES

(Rounds 2000).

Currently known cumulative impacts on BLM RD # 3309 would be limited to grazing and recreation activities described in Chapter 3, and occasional traffic associated with oil and gas exploration activities. The increased traffic associated with drilling and field development of the interim drilling program would accelerate maintenance requirements; however, associated costs may be offset by project-related revenues generated, which are described in Section 4.11.

4.16.14 Health and Safety

Cumulative health and safety impacts would be limited to those associated with the 200 well interim drilling proposal and existing grazing and recreation activities. Occasional traffic and activity associated with oil and gas exploration activities would generate small increases in risks to project workers and the public. Cumulative impacts to health and safety conditions are anticipated to be similar to those described for the Proposed Action.

4.16.15 Noise

Noise would result from on-going construction, drilling, and CBM operations during the life of the project. Increased traffic on existing transportation system roads within the project area would occur, thus adding to existing traffic noise. Given the current and anticipated low traffic volumes, and dispersed nature of traffic and CBM operations within the BCPA, the projected additions to cumulative, traffic-related noise impacts would be minimal.