

## **4.0 ENVIRONMENTAL CONSEQUENCES**

---

### **4.1 INTRODUCTION**

This chapter analyzes the potential environmental consequences that would result from implementation of Alternative 1 – Proposed Action, Alternative 2, or Alternative 3 – No Action alternative. The Proposed Action is found in Chapter 2.

This analysis of environmental consequences addresses the direct and indirect impacts associated with exploration and interim development of the Red Rim Project Area. It also addresses cumulative impacts that would result from past, present, and reasonably foreseeable future actions (RFFAs) within a cumulative impact assessment area relevant to the resource analyzed. The description of environmental consequences includes the following subsections, where applicable:

#### **4.1.1. Direct and Indirect Effects**

This subsection analyzes the level and duration of direct and indirect effects that would occur because of the Proposed Action, Alternative 2, or the No Action alternative. The impact evaluation assumes that the applicant-committed and BLM-required practices described in Chapter 2 would be implemented.

#### **4.1.2. Cumulative Impacts**

This section describes impacts that are likely to occur as a result of this project. These impacts are described in combination with other ongoing and recently approved activities, recently constructed projects and other past projects, and projects that are likely to be implemented in the near future (RFFAs).

This environmental analysis addresses cumulative impacts associated with exploration and interim development of 200 interim coal bed natural gas (CBNG) wells and other activities, ongoing or proposed, within the Atlantic Rim EIS study area. The proposed project (Red Rim POD) is included in the 200 wells. The Atlantic Rim area is located generally in Townships 13 through 20 North and Ranges 89 through 92 West in Carbon County, Wyoming. Cumulative impacts associated with exploration and development of the Project Area (Red Rim area) are described later in this chapter.

### **4.2 GEOLOGY, MINERALS, AND PALEONTOLOGY**

#### **4.2.1. Alternative 1 - Proposed Action**

Use of cut and fill construction techniques to develop well locations, access roads, and facilities would alter existing topography. An estimated 141,5 acres would be affected by surface-disturbing activities. Use of proper construction techniques, described in Chapter 2, would reduce the effects associated with topographic alteration.

In addition, as discussed in Chapter 3, no major landslides have been mapped within the Project Area. By following prescribed procedures, construction would not be likely to activate landslides, mudslides, debris flows, or slumps. Seismic activity is low in the area, so the potential for an earthquake to damage project facilities is minimal.

Drilling the wells may result in discovery of CBNG resources. An economic discovery in the Project Area, in conjunction with other economic discoveries under the Interim Drilling Policy, could lead to full-scale development, which is currently being analyzed in the Atlantic Rim EIS (in preparation). If no natural gas is discovered, however, additional exploratory wells may or may not be drilled, depending on the information obtained in drilling the proposed wells. In addition, the Atlantic Rim EIS may not be required or may be modified. No other major mineral resources would be affected by the project.

As discussed in Chapter 2, mitigation measures presented in the sections on Water Resources or Soils would avoid or reduce potential effects 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 prevent potential effects on the subsurface geologic environment.

It is not anticipated that development of the project would affect any sensitive resource area, such as a high-density paleontological site or stabilized sand dunes. Although the surface-disturbing activities associated with the project could disturb paleontological resources, the potential for recovery of important vertebrate fossils in the Project Area is considered low to moderate. Excavation associated with development of access roads, well pads, gas and water pipelines, and related gas production and water disposal facilities could directly expose, damage, or destroy scientifically significant fossil resources. For example, fossils may be damaged or destroyed by erosion that is accelerated by disturbance from construction. In addition, improved access and increased visibility as a result of construction and ongoing production may damage or destroy fossils through unauthorized collection or vandalism. However, no occurrences of paleontological resources are documented in the Project Area. Mitigation measures discussed in Chapter 2 would protect potential paleontological resources that may be inadvertently uncovered during excavation.

#### **4.2.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on geology, minerals, and paleontological resources likely would be similar to the impacts that would occur from implementation of the Proposed Action.

#### **4.2.3. Alternative 3 - No Action Alternative**

The No Action alternative would involve denial of the Red Rim Pod on public lands in the Project Area. Under the No Action alternative, ongoing natural gas production activities would be allowed to continue but the coordinated exploration and interim development described in the Red Rim Plan of Development (proposed project) would

not be authorized by BLM. Development on public would not be considered again until the EIS for the Atlantic Rim Natural Gas Project is completed. The federal CBNG resources in the Project Area would not be depleted if the proposed wells are not drilled. Furthermore, additional information on natural gas accumulation under federal lands in this area of the Great Divide Basin may not be obtained, and the collective knowledge base may not increase.

## **4.3 AIR QUALITY**

### **4.3.1. Alternative 1 - Proposed Action**

The small number of exploratory wells and facilities included in the project would generate only a small amount of air pollutants. Some temporary effects on air quality would likely occur in the immediate vicinity of the project, caused by particulate matter and exhausts from vehicles and equipment. These effects would be local and would be dispersed by prevailing winds. The effects on air quality would be minimized through dust abatement practices.

No noticeable deterioration in visibility would occur at Class I or sensitive Class II wilderness areas that are located within 100 miles of the project (Mount Zirkel, Rawah, Savage Run, Platte River, Huston Park, or Encampment River). Dispersion by the wind of the small quantity of air pollutants generated by the project would likely eliminate formation of regional haze or acid deposition.

If these wells were deemed economical to produce, the Companies would be required to file an application with WDEQ for an air quality permit for oil and gas production facilities under Section 21 of the Wyoming Air Quality Standards and Regulations.

No violations of applicable state or federal air quality regulations or standards are expected to occur as a result of direct or indirect emissions of air pollutants from natural gas development (including both construction and operation) in the Project Area.

Air emissions would occur from construction and production of gas wells within the Project Area. Emissions from construction would include PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO, and volatile organic compounds (VOCs) from ground clearing, use of heavy equipment, drilling, and well completion, as well as from construction of access roads. Emissions from construction are temporary and would occur in isolation, without significantly interacting with emissions from adjacent wells.

Production emissions of NO<sub>x</sub>, CO, VOCs, and hazardous air pollutants (HAPs) (specifically formaldehyde) would result primarily from operation of compressor engines. Estimated impacts to air quality assumed that the average potential emission rate of NO<sub>x</sub> for the compressor engines would be approximately 2 grams per horsepower-hour (g/hp-hr) of operation. This rate reflects emission control levels that have already been required in similar applications and is conservative when compared with the emissions projected in Chapter 2, (less than 1.5 g/hp-hr). WDEQ-AQD operating permit records also have shown existing facility emissions to be substantially less than 2.0 g/hp-hr. The

emissions generated from operation of the compressors would contain negligible amounts of SO<sub>2</sub> and particulate matter because of the composition of natural gas from coal seams in the Mesaverde Group. Production emissions from the compressor engines would occur over the life of the project. Emissions from production wells would be negligible because the produced gas is nearly 100 percent methane and would require no ancillary production facilities at the well site.

Pollutant emissions from construction and operation of natural gas fields near the Project Area have been analyzed in recent air quality studies completed by BLM under NEPA. Studies conducted for the Continental Divide/Wamsutter II and South Baggs Natural Gas Development Projects (BLM 1999a, 2000) indicated potential near field increases in concentrations of CO, NO<sub>2</sub>, PM<sub>10</sub>, and SO<sub>2</sub>; however, the predicted maximum concentrations would be well below applicable WAAQS, CAAQS, and NAAQS. Similarly, predicted concentrations of HAPs (specifically formaldehyde) would be below various 8-hour maximum Acceptable Ambient Concentration Levels, and the related incremental cancer risks to residents would also be below applicable significance levels.

The emissions that would result from implementation of this project would be much the same as those projected for other oil and gas projects, such as Continental Divide, but on a smaller scale. The exploratory project described in this EA is within the limit of the 3,000-well air quality analysis prepared for the Continental Divide EIS, considering that only 2,130 wells were authorized for that project. The analysis for the Continental Divide EIS project included impacts to Class I areas from oil and gas development in southern Wyoming. Based on the relative size of this project, including the associated lateral sales pipeline, when compared with the magnitude of these previous projects, no ambient air quality standards would be violated and no adverse air quality conditions would result from the proposed project.

#### **4.3.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on air quality likely would be similar to the effects that would occur under the Proposed Action.

#### **4.3.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on air quality would be expected to occur beyond the current pollutant concentrations if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

## 4.4 SOILS

### 4.4.1. Alternative 1 - Proposed Action

The proposed construction and operation of wells and facilities could affect the productivity of soils in the Project Area by:

- Ø Removing existing vegetation cover;
- Ø Redistributing or removing all or part of the soil profile;
- Ø Compacting soils;
- Ø Exposing soil to accelerated wind and water erosion;
- Ø Potentially covering adjacent soils and drainages with sediments;
- Ø Exposing the soil to noxious and invasive weed infestation;
- Ø Potentially increasing soil salinity and sodicity (only the tributaries to Hadsell Draw that would receive discharge of conditioned water); and

These activities would reduce soil productivity within and immediately adjacent to the proposed areas of disturbance. The effects of these activities on soil productivity have been evaluated based on their duration, magnitude, and intensity and are described below. The measures that would be used to prevent, reduce or mitigate the effects of these activities on soil productivity are identified below. The residual impacts (if any) to the soils productivity and their significance are identified.

Both long-term and short-term effects on soil productivity would occur under the Proposed Action. An estimated 141.5 acres of surface disturbance would occur as a result of well drilling and testing, and construction of facilities. If exploratory wells are productive, an estimated 39.2 acres of land would remain disturbed after initial reclamation for the production of natural gas. Therefore, approximately 102.3 acres would be affected in the short term only (i.e., no more than 2 to 4 years) and 39.2 acres would be affected in the long term (i.e., for as long as 15 to 20 years). The land area potentially affected by the discharge of conditioned water is difficult to estimate with a high degree of certainty. However, for the purposes of this analysis, it is assumed that a 20-foot corridor would be affected along approximately 2.75 miles of tributaries to Hadsell Draw, or 6.6 acres.

Vegetation and soil would be removed from a total of 141.5 acres of land, and subsoil would be redistributed to create well and compressor pads. Discharge facilities, roads, and other facilities including trenches for burying water delivery pipelines would also result in soil and vegetation removal.

Removed and redistributed soils would be:

- Ø Compacted in localized areas due to equipment traffic;
- Ø Susceptible to accelerated wind and water erosion and deposition due to an increase in the amount of exposed and unprotected soil surfaces; and

- Ø Susceptible to noxious and invasive weed infestation due to the removal of desirable perennial vegetation.

As a result, the productivity of soils would decline due to:

- Ø Reduced soil microbial activity and soil fertility;
- Ø Interruption of nutrient and organic matter addition to soil from vegetation;
- Ø Impaired water infiltration from soil compaction.
- Ø Mixing of soil horizons and soils of differing chemistry/composition.
- Ø Top soil loss; and
- Ø Introduction of weed seeds and propagules.

The intensity of these effects would vary according to the type and location of disturbance, development and production activities, and the period of disturbance prior to reclamation.

Soil and vegetation productivity would potentially decline due to the discharge of conditioned water into tributaries of Hadsell Draw. Soil may potentially decline due to:

- Ø Reduced soil permeability to water and air caused by:
  1. Disruption of soil aggregation resulting from the excess sodium loading to the soil.
  2. Deterioration of soil structure due to the swelling and dispersion of clays resulting from excess sodium loading to the soil.
  3. Cementation of soil and the obstruction of soil pores due to the precipitation of  $\text{CaCO}_3$  (lime) and  $\text{CaSO}_4$  (gypsum).
- Ø Disruption of plant osmotic regulation due to elevated soil salinity, which reduces or limits water uptake by plant roots due to excessive concentration of salt ions regardless of the type of ion or ionic species.
- Ø Toxicity or deficiency of particular ionic species such as sodium or bicarbonate and calcium.
- Ø Anoxic soil conditions induced by frequent, extensive, and prolonged inundation.

In addition, water erosion could increase in drainages downstream from development caused by runoff from the release of produced water. A more detailed description of erosive effects to drainages is contained in the discussion of surface drainages in the section on Surface Water.

To address these soil productivity issues, the Companies have committed to using the BMPs described in the Master Surface Use Program (MSUP) ([Appendix B](#)) and Chapter 2 during construction, operation, and reclamation that, combined with existing regulatory requirements, would reduce the effect on soil productivity through:

- Ø Removal and storage of soils prior to drilling and testing;
- Ø Scarification of disturbed areas prior to soils redistribution;
- Ø Management of noxious weeds and invasive species;
- Ø Timely and effective erosion control and revegetation in disturbed areas; and,

- Ø Treating of soils with amendment (if necessary) and seeding with salt tolerant species within the tributaries of Hadsell Draw that would receive conditioned water.

Following the drilling and testing activities and the construction of facilities, the disturbed areas not required for production of natural gas, or an estimated 108.5 acres, would be reclaimed as described in the MSUP ([Appendix B](#)) and Chapter 2. Facility areas and roads would be regraded to blend the disturbed area into the surrounding topography. Regraded areas and redistributed soil would be scarified to alleviate compaction, seeded, and protected from wind and water erosion. Measures to control erosion, runoff and sedimentation during operations and reclamation also are described in the MSUP ([Appendix B](#)) and Chapter 2.

However, native plant species may be excluded if noxious and invasive weed species invasion progresses to the point that the density of desirable plant species and plant diversity is reduced. Therefore, the procedures and measures that would be used to identify and eradicate undesirable plant species on soil stockpiles, disturbed areas, and areas that are undergoing reclamation are described in the MSUP and Chapter 2.

The anticipated reduction in soil productivity would require many years to fully recover due to low annual precipitation and soil fertility and the short growing season. However, the majority of the sagebrush/grassland community that would be disturbed by the Proposed Action is decadent with little herbaceous and grass cover and diversity. Therefore, the reclamation of disturbed areas would initially lead to greater diversity and production of herbaceous and grass species. In addition, the structural diversity of the sagebrush/grassland vegetation community would increase due to the reclamation of disturbed areas. Eventually recolonization of the reclaimed area by surrounding native shrub species would reduce production of herbaceous and grass species. Species numbers and structural diversity also would be reduced. Reclamation would reduce erosion within the disturbed area and would more than compensate for the loss in soil productivity due to gas development.

For the 41.1 acres that would be affected in the long term, the impacts to soil productivity described above would be slightly more intense and prolonged. However, the intensity of the reduction in microbial activity and organic matter addition and its effect on inherent soil fertility will be substantially greater than for soils that would be disturbed in the short term. To minimize this long-term effect on soil productivity, the BMPs described in Chapter 2 would be implemented.

Conditioning of produced water prior to release into the tributaries of Hadsell Draw would reduce the deleterious effect of water-soluble salts and SAR on productivity of the soil. Produced water would be routed to two centralized conditioning facilities, which would treat the water before it is discharged to surface drainages. The water would be conditioned using a proprietary, natural mineral-based process that would result in reduced levels of specific conductance and SAR.

Based on monitoring of soils and vegetation in the tributaries of Hadsell Draw that would receive conditioned water, the BMPs described in Chapter 2 would be implemented to reduce the potential detrimental effects of produced water on soil productivity.

Impacts to soil resources in the Project Area are anticipated to be minimal based on the following:

- Ø Small area of disturbance;
- Ø Small amount of disturbance to the soil map units when compared with the area covered by these map units in Carbon County;
- Ø Use of proper construction and reclamation techniques; and,
- Ø Implementation of the measures described in Chapter 2.

Depending on the rate of infiltration, storage or discharge within soils of produced water could alter the physical and chemical properties of soils. Water erosion would increase in drainages downstream from development caused by runoff from the release of produced water. A more detailed description of erosive effects to drainages is contained in the discussion of surface drainages in the section on Surface Water.

#### **4.4.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on soils likely would be similar to the effects that would occur from implementation of the Proposed Action. Surface disturbance for Alternatives 1 and 2 would be the same because these alternatives include the same number of wells and related facilities. Under Alternative 2, injection wells would be used to dispose of produced water from federal wells, which would reduce disturbance of soils and soil loss.

#### **4.4.3. Alternative 3 - No Action Alternative**

This alternative would also most likely limit the effects of produced water discharge to Abundance tributary, Hadsel Draw, and all of Bountiful Draw from potential salt load effects.

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on soils would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.5 WATER RESOURCES**

#### **4.5.1. Alternative 1 - Proposed Action**

Minimal effects on aquifers and groundwater quality would be anticipated as a result of the project with proper construction techniques, drilling practices, and BMPs described in the MSUP and Chapter 2. Groundwater would be removed from the coal seam aquifers

within the Allen Ridge, Pine Ridge, and Almond Formations, members of the Upper Cretaceous Mesaverde Group. Well testing is intended to lower the hydraulic head in the affected coal seam aquifer. (The reduction of hydraulic head in an aquifer also is referred to as drawdown.) Relative to the available drawdown within the aquifer, the effect on the coal aquifer during the interim drilling project is expected to be minimal.

These targeted coal seams are classified as confined to semi-confined aquifers because they are bounded by confining layers that consist of impervious to semi-pervious layers of shale and siltstone. Hydraulic connection between the coal seams and any aquifer stratigraphically above or below the coal seams is limited. The hydrostatic head of the water measured in test wells completed in coal seams near the Project Area can be considerably higher than the elevation of the ground level at a specific well location. Confined, or artesian, aquifer conditions of this type indicate an effective seal above and below the aquifer. However, lowering the hydraulic head in the coal seam aquifers by removing water may induce a slight leakage through the semi-pervious shale layers into the pumped aquifer. Because of the extremely low hydraulic conductivity of the confining layers and the limited number of gas wells proposed, enhanced leakage from any aquifer stratigraphically above or below the affected coal seams would be minimal.

The water level in existing water wells completed in the Mesaverde aquifer also may be lowered or drawn down. As a result, the potential yield from nearby water wells may be affected by removal of groundwater under the project. However, no water wells permitted by the WSEO are known to occur within a mile of the Project Area; therefore, effects to nearby water wells are not expected to occur.

Under this alternative, the water produced from the exploratory wells would be conditioned using a proprietary, natural mineral-based process and discharged to ephemeral tributaries of Hadsell Draw within the Great Divide Basin. Injection wells would be used to dispose of the waste stream from the conditioning facilities. The proposed injection targets for each injection well are the Hatfield, Cherokee, and Deep Creek Sandstones, located 5,965 to 6,335 feet below the surface. These injection wells are stratigraphically below the coal zones explored. Injection of the wastewater is not expected to result in any deterioration in quality of useable groundwater within the injection horizon. These sandstones are isolated above and below by competent shale barriers that would prevent initiation and propagation of fractures through overlying strata to any zones of fresh water. The Cherokee or Deep Creek Sandstone would be tested to evaluate its suitability for disposal before any water is injected. Maximum pressure requirements to prevent initiation and propagation of fractures through overlying strata to any zones of fresh water would be determined and would be regulated by the State of Wyoming and the BLM. The only effect on the injection horizons would consist of an increase in the hydraulic head emanating from the injection well, which would dissipate with distance away from the wellbore. The minimum capacity of the two proposed injection wells is estimated at 5,000 barrels per day (BPD) for each well. The water conditioning facilities would generate about 300 BPD of wastewater. Additional capacity for injection would be available, if needed, for produced water should the water conditioning facilities be shut down for maintenance, or the water reaches the in-channel reservoir on Hadsell Draw. The effect of the Proposed Action on the injection horizon would be minimal in terms of groundwater quantity and quality.

Shallow sources of groundwater (stratigraphically above the Mesaverde coal zones) are not likely to be affected by the project. Ponds associated with the water conditioning facilities would be lined to minimize impacts to shallow groundwater.

Water used for drilling the gas wells would be obtained from existing wells completed in the coal seams of the Mesaverde Group. This use would be relatively small and would not adversely affect existing sources for or rights to groundwater.

Potential impacts that could occur to surface water resources as a result of the project include increased surface water runoff and off-site sedimentation caused by surface disturbance, increased streamflows, impairment to surface water quality, and changes in morphology of the stream channel caused by construction of road and pipeline crossings. Effects on surface water resources would depend on:

- Ø The proximity of the disturbance to a drainage channel,
- Ø The aspect and gradient of the slope,
- Ø The areal extent of soil disturbance,
- Ø Characteristics of the soil,
- Ø Duration of construction, and
- Ø Timely implementation and success or failure of mitigation measures.

Surface disturbance associated with drilling would increase the potential for erosion or increased sediment load to ephemeral drainages within the Project Area. These disturbances include removing vegetation and stockpiling topsoil, road construction, or shallow excavations for drill pads or facilities. Implementation of the mitigation measures described in Chapter 2 would control wind and water erosion at disturbed sites so that ephemeral drainages are not affected by interim drilling. The Companies have committed to the practices described in Chapter 2 that include design of surface-disturbing activities in a manner that diverts and controls runoff, as needed, and provides for re-establishment of vegetation on disturbed areas at the earliest opportunity. These measures, collectively, would represent BMPs for erosion control. The application of these BMPs would result in minimal impacts on water and soil resources.

Construction would occur over a relatively short period. Impacts from construction would likely be greatest shortly after the project starts and would decrease in time as a result of stabilization, reclamation, and revegetation. The construction disturbance would not be uniformly distributed across the Project Area; instead, construction would be concentrated near the proposed wells.

During production, water produced from exploratory wells would be discharged to ephemeral tributaries of Hadsell Draw. Surface discharge would create a mean annual flow in the Abundance and Bountiful Tributaries by 0.71 cubic feet per second (cfs) in Abundance and 0.43 cfs in Bountiful, provided the NPDES permit is approved by the WDEQ and effluent limitations specified in the permit are achieved. Although this scenario is the most likely for discharge, all the wells at one time could discharge to a single outfall, resulting in a maximum discharge of 1.14 cfs at a specific outfall, if approved by the WDEQ. This analysis assumes an initial maximum flow rate of 32

gallons per minute (gpm) from each well. Maximum discharge would be expected to occur after several months of production and then to decline over the life of the producing wells. Because of the piping arrangement of the wells to the outfalls, flow rates for Hadsell Draw and its tributaries may vary at different times of the year.

Continuous discharge of produced water to previously ephemeral drainages would cause native vegetation to undergo changes that could affect the stability of existing spillways and natural channels. As these changes occur, native dryland grass communities would be replaced with wetland species that are more tolerant to and characteristic of perennial flows. Growth of wetland/riparian species would contribute to channel stabilization and erosion control during high precipitation events. Surface drainages in the Project Area may also be affected by increased flows from discharges of produced water where channels are not stable, armored, or large enough to accommodate the anticipated flows. BMPs described in the WMP ([Appendix D](#)), such as locating the outfalls in well-developed, low-gradient channels and lining the channels with crushed rock, would dissipate energy and minimize erosion of the receiving drainages.

Surface water quality is not expected to be affected by the discharge of produced water. The water the Companies plan to produce generally meets WDEQ water quality standards for livestock and wildlife watering. Conditioning the water to meet criteria for irrigation water quality could provide beneficial use in the form of enhanced natural infiltration, growth of possible riparian and grazing species near flowing channels, and irrigation for local ranchers. Flows of produced water would not be expected to reach Separation Creek and ultimately Separation Lake, a Class 3 water that is 43 miles from the discharge outfalls. If water reaches the in-channel reservoir on Hadsell Draw (<1 miles) additional water will be injected. Monthly water balances indicate that in-channel infiltration would accommodate all of the produced water flow within Hadsell Draw. Thus, the probability that produced water would reach Separation Lake, where water quality standards for aquatic life would apply, would be extremely low.

A small portion of the water produced from the gas wells would be dispensed for use by livestock. This water would be piped into self-contained tire tanks and would not discharge into surface drainages. About 5 gpm per well (8.1 acre-feet/year) would be available for beneficial use. The upgrade of an existing reservoir in the Project Area would provide additional beneficial use for livestock watering operations.. Abundance Reservoir would be designed as a flow-through structure and would be properly permitted through the WSEO. This reservoir would be downstream of the tributary outfalls to Abundance Tributary and would provide erosion control during high flow in the drainage. The reservoir would increase the seepage loss in the basin, but would not remove a significant amount of water from the system because evaporation would be minimal based on reservoir size.

The Companies have committed to the mitigation and monitoring plan described in the proposed Water Management Plan ([Appendix D](#)) to ensure that surface discharge of produced water from the Red Rim POD wells under the Proposed Action would not affect designated uses of the surface waters in the Project Area or change the physical or biological components of Hadsell Draw and its tributaries.

#### **4.5.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Under Alternative 2, the effects on water resources would be similar to the Proposed Action, with the exceptions described below.

Under this alternative, almost all the produced water from the proposed federal wells would be injected, which would decrease the volume for surface disposal. Produced water from non-federal wells would be discharged to ephemeral tributaries of Hadsell Draw. Surface discharge would increase the mean annual flow in the Abundance Tributary by 0.50 cfs and in the Bountiful Tributary by 0.28 cfs, provided the NPDES permit is approved by the WDEQ and effluent limitations specified in the permit are achieved. Although this scenario is the most likely for discharge, all the wells at one time could discharge to a single outfall, resulting in a maximum discharge of 0.78 cfs at a specific outfall, if approved by the WDEQ. Therefore, under this alternative, injection of the water produced from the federal wells would decrease the volume of water for surface disposal by about 32 percent. This reduced volume would limit the effects on the ephemeral channels from increased flows in the Project Area.

The mitigation and monitoring plan described in the proposed Water Management Plan ([Appendix D](#)) would ensure that surface discharge of produced water from wells in the Project Area under Alternative 2 would not affect designated uses of the surface waters in the Project Area or change the physical or biological components of Hadsell Draw and its tributaries.

#### **4.5.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on water resources would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

The mitigation and monitoring plan described in the proposed Water Management Plan ([Appendix D](#)) would ensure that surface discharge of produced water from the Red Rim POD wells under the No Action alternative would not affect designated uses of the surface waters in the Project Area or change the physical or biological components of Hadsell Draw and its tributaries.

## **4.6 VEGETATION, WETLANDS, AND NOXIOUS WEEDS**

### **4.6.1. Alternative 1 - Proposed Action**

#### **4.6.1.1. Vegetation**

Implementation of the project would result in loss of natural vegetation in terms of cover and species composition in areas where well sites, facilities, and access roads would be constructed. Use of BMPs described in the MSUP ([Appendix B](#)) and Chapter 2 during construction, operation, and reclamation would minimize effects on vegetation resources. An estimated 149.6 acres would be affected by surface-disturbing activities during drilling, testing, and pipeline construction. Topsoil would be stockpiled, and reclaimed areas would be seeded with site-specific mixes approved by the BLM or the landowner, as appropriate, to avoid permanent loss of species diversity and vegetative cover.

Should the exploratory wells be productive, the surface areas required for production facilities would not be reclaimed until production ends, which could be up to 20 years. An estimated 41.1 acres could be affected by production facilities over the long term. Reclamation efforts would initially lead to greater species and structure diversity within these communities. Herbaceous species composition and production would be increased, once established, until big sagebrush or other shrubs reoccupy disturbed areas.

In general, the duration of effects on vegetation in the Project Area would depend on the time required for reclamation and natural succession to return disturbed areas to pre-disturbance conditions of diversity (both species and structural). Reestablishment of pre-disturbance conditions would be influenced by factors that are both climatic (growing season, temperature, and precipitation patterns) and edaphic (physical, chemical, and biological conditions in soil). Edaphic factors would include the amount and quality of topsoil salvaged, stockpiled, and spread over disturbed areas.

Surface disturbance could affect vegetation directly and indirectly by destroying existing vegetation. The Wyoming sagebrush, big sagebrush, greasewood, and saltbush vegetation that would be disturbed due to the proposed action are common in southwestern Wyoming. In addition, topsoil would be stockpiled, and reclaimed areas would be seeded with site-specific seed mixtures to avoid permanent loss of species diversity and vegetative cover. Therefore, short-term or long-term loss in acreage described above would not alter the overall abundance and quality of the vegetation community.

Surface disturbance also could affect vegetation indirectly by introducing noxious and invasive weeds. Weedy species often thrive on disturbed sites such as road ROWs and out-compete more desirable plant species. Increased invasion by weeds may render a site less productive as a source of forage for wildlife and livestock. However, if the mitigation measures summarized in Chapter 2 are applied, invasion of noxious and invasive weed species is not expected.

Surface discharge of produced water from gas wells has the potential to alter vegetation patterns in areas downstream of discharge points. The increased availability of water along normally dry stream channels would increase the extent of riparian and wetland vegetation and cause a corresponding decrease in the upland vegetation that formerly occupied these areas. This shift in vegetation types would create another type of disturbance that could be exploited by weed species. The extent of these changes depends on the locations chosen for discharge points and on the existing vegetation downstream.

An indirect impact on vegetation resources in the Project Area would be increased water levels and rates of flow through stream corridors. Vegetation communities at particular risk of alteration as a result of rising stream levels are shrublands along the upland border of riparian areas. Wyoming big sagebrush is intolerant to root-zone inundation. The vigor of big sagebrush is reduced in response to short periods of surface flooding, and flooding for a period of 21 to 28 days can result in complete mortality of big sagebrush (GHEP 2003). Greasewood showed more tolerance to flooding, enduring 40 to 42 days of flooding before any visible effects were detected and 60 days of continuous flooding before any wilting appeared. Shrubs would likely die off along the edges of riparian areas long before riparian species are able to migrate laterally and take advantage of the open space with abundant water available. Instead, an area vulnerable to invasion of weeds would develop. Areas where species mortality occurs would be seeded as described in Chapter 2 with desirable species before weeds invade.

Changes in water salinity and soil permeability to water and air pose another indirect effect to vegetation resources within the Project Area. Vegetation communities develop in association with certain environmental conditions such as available water and soil properties. Increases in salinity and reductions in soil permeability may also favor establishment of weeds. However, produced water would be routed to a centralized conditioning site, where it would be conditioned using a proprietary, natural mineral-based process that would reduce levels of SAR. The conditioned water would be discharged into ephemeral tributaries of Hadsell Draw provided it meets the applicable water quality standards for irrigation. There would be no harmful effects to vegetation from increased SAR levels in the conditioned water if the BMPs described in Chapter 2 are implemented.

#### **4.6.1.2. Wetlands**

No riparian areas or wetlands have been identified in or near the Project Area, including the pipeline route. Therefore, the Proposed Action would not affect existing wetlands.

#### **4.6.1.3. Threatened and Endangered Species**

No threatened or endangered plant species or their habitat are known to occur in the Project Area. Development of the project would not be expected to directly or indirectly affect federally listed species.

#### **4.6.1.4. Species of Concern**

The distribution of plant species of concern is limited in the Project Area because of a lack of suitable habitat. Given the low likelihood that the sensitive plant species occur in the Project Area ([Appendix E](#)), implementation of the proposed BMPs and mitigation measures, and the small amount of disturbance associated with the project, no direct or indirect effects to plant species of concern would be expected.

#### **4.6.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on vegetation and weeds likely would be similar to the impacts that would occur from implementation of the Proposed Action, but would be lessened because water produced from the federal wells would not be discharged on the surface. The facilities proposed for Alternative 2 are similar to the Proposed Action and would result in similar short- and long-term disturbances. The principle difference between the Proposed Action and Alternative 2 is the different method for disposal of produced water from federal wells. Injection wells would be used to dispose of the produced water from the federal wells, which would mitigate possible effects of surface discharge on vegetation. Produced water from fee wells would be conditioned and discharged into ephemeral drainages on fee lands. Implementation of Alternative 2 would result in lower potential for effects on vegetation within the Project Area than Alternative 1 because of the reduced volume of surface water discharges.

#### **4.6.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on vegetation or wetland and riparian habitats would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.7 RANGE RESOURCES AND OTHER LAND USES**

#### **4.7.1. Alternative 1 - Proposed Action**

Anticipated effects on range resources associated with the project are limited to increased availability of water for livestock, a minimal loss of forage, an increased potential for collisions between livestock and vehicles, and an increased potential for the spread of noxious and invasive weeds (previously discussed above under the section on Vegetation, Wetlands, and Noxious Weeds). The project itself (well pads, access roads, pipeline routes, etc.) would not have noticeable effects on range resources; Water discharge from the project would, however effect range resources. Primary effects center around changes in grazing patterns due to available water, secondary effects to upland and riparian vegetation from changes to grazing patterns. In 2 to 3 years, reclaimed areas

would have higher forage production that would more than compensate for the short-term loss of forage due to development if livestock and wildlife foraging is controlled. Failure to control foraging could have adverse effects on re-generated forage.

Livestock grazing would continue during the drilling and interim development. Forage in the Project Area would be reduced slightly during drilling and field development and would be restored as soon as practical. Areas used for roads, production equipment, and ancillary facilities would remain disturbed throughout the productive life of the field. Temporary, self-contained water troughs or stock tanks that can be established for livestock use would benefit livestock season-of-use and distribution, particularly in the years with below normal levels of precipitation. Additional water sources would have to be controlled to avoid year round useage by livestock. This area is currently used as a late fall/winter/early spring pasture concentrating cattle use on plants during the dormant season. Unrestricted use during the growing season will put stress on forage plants during their grow period possibly reducing vigor and abundance of desireable plant species, and corresponding reduction of range conditions.

The project would result in an estimated 149.6 acres of short-term disturbance during drilling, interim development, and construction of the delivery pipeline. An estimated 41.1 acres of long-term disturbance would remain after the initial reclamation measures described in Chapter 2 are completed. The short-term disturbance from portions of drill pads that are not needed for production facilities would be reclaimed as soon as practical after drilling ends, as would all areas disturbed for gas and produced water pipelines. All remaining disturbed areas would be reclaimed at the end of field operations, except any that BLM may identify as desirable for another use.

The average stocking rate for the Sixteen Mile Allotment is 11 acres per AUM. The project would result in a short-term loss of forage associated with about four AUMs. This loss would correspond to a small short-term reduction in available forage within the Sixteen Mile Allotment that would amount to substantially less than 1 percent of the total grazing capacity in the allotment. Also, disturbances would be interspersed throughout the Project Area, and should not affect grazing in the Sixteen Mile Allotment. Although disturbance from theaactual project should not effect grazing in the allotment, the water discharge from the project has the potential to affect grazing and the rangeland resource.

There is potential for conflict between activities under the project and range operations. Conversely, the activities under the project also could benefit range operations. Reclamation may increase forage production and availability, since shrubs would be removed in disturbance areas and shrub species would be slow to recover.

The increased availability of water for livestock at locations shown on [Figure 2-1](#) could encourage concentration of livestock in these areas. Concentration of livestock near new supplies of water could result in overuse of some areas, unless the movements of livestock are controlled. Control of livestock movements by the addition of fencing also would affect the movements of wildlife in the same area. A condition of approval for the proposed project that would require the Companies to initiate development of a cooperative plan for fencing among affected interests would provide a reasonable approach for addressing this concern. Without some means of controlling livestock

access to the produced water, the season, duration and/or intensity of use in this area will change, most likely adversely affecting range land vegetation.

#### **4.7.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on range resources likely would be similar to the effects that would occur from implementation of the Proposed Action. The facilities proposed under Alternative 2 are identical to the Proposed Action and would result in the same short- and long-term disturbances. The principal difference between the Proposed Action and Alternative 2 is the different method for disposal of produced water from federal wells. Injection wells would dispose of the produced water from the federal wells, which would mitigate possible effects of surface discharge to vegetation. Produced water from fee wells would be conditioned and discharged onto fee lands.

#### **4.7.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on range resources would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.8 WILDLIFE AND FISHERIES**

#### **4.8.1. Alternative 1 - Proposed Action**

The effects on wildlife would be associated with construction and operation and would include displacement of some individuals of some wildlife species, loss of wildlife habitats, and an increase in the potential for collisions between wildlife and motor vehicles. Other potential effects include a rise in the potential for illegal kill, harassment, and disturbance of wildlife because of increased human presence and improved vehicle access. The increased availability of water in the Project Area could affect the movements of wildlife in the area. Any additional fencing constructed to control the movements of livestock also could affect the movements of wildlife. The effects of the increased availability of water are described under Range Resources and Other Land Uses. The magnitude of impacts to wildlife resources would depend on a number of factors, including the type and duration of disturbance, the species of wildlife present, the time of year, and successful implementation of avoidance and mitigation measures.

The capacity of the Project Area to support various wildlife populations should remain essentially unchanged from current conditions. Only a small proportion of the available wildlife habitat in the Project Area would be affected. Construction, operation, and maintenance of the proposed wells and associated facilities are expected to have minimal short-term effects on wildlife in the Project Area. Some wildlife species may be temporarily displaced during construction on pipeline routes, well sites, and access road

locations, but should return once construction is complete. Furthermore, extensive suitable habitats for many species exist on lands adjacent to the Project Area and would support any individuals that may be temporarily displaced. Long-term effects on wildlife are expected to be minimal, as most species would become accustomed to routine operation and maintenance.

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 pre-disturbance conditions. The unused portion of well sites and pipelines would be reclaimed during the production phase. After production operations end (the life of the project is estimated at 10 to 20 years), the well fields and ancillary facilities would be reclaimed and abandoned. Well pads would be removed; the areas would be revegetated with seed mixes approved by the BLM, and of these mixes, some are specifically designed to enhance use by wildlife. Grasses and forbs would be expected to become established within the first several years after reclamation; however, much more time would be required to re-establish shrub communities. Consequently, disturbance of shrub communities would result in a longer-term loss of the habitats.

In addition to the direct loss of habitat caused by construction of well pads and associated roads and pipelines, disturbances from human activity and traffic would reduce use of habitat immediately adjacent to these areas. Species that are sensitive to indirect human disturbance (both noise and visual) would be most affected. The effectiveness of habitat in 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, however, and many animals could become accustomed to equipment and facilities in the gas field and may return to habitats adjacent to disturbance areas.

#### **4.8.1.1. Small Mammals and Birds**

The direct disturbance of wildlife habitat in the Project Area likely would reduce the availability and effectiveness of habitat for a variety of common small mammals, birds, and their predators. The initial phases of surface disturbance and increased noise that are likely would result in some direct mortality to small mammals and would displace songbirds from construction sites. In addition, a slight increase in mortality from increased vehicle use of roads in the Project Area would be expected. Quantification of these losses is not possible; however, the loss is likely to be low over the short term. Increased noise from compressor engines and other production activities would displace some animals and would affect the production potential of some species during the operations phase of the project. Based on the relatively high production potential of these species and the relatively small amount of habitat disturbed, however, populations of small mammals and songbirds would quickly rebound to pre-disturbance levels. This rebound would be expected after pipelines, unused portions of roads, well pads, and wells that are no longer productive have been reclaimed. No long-term effects on populations of small mammals and songbirds would be expected.

#### **4.8.1.2. Big Game**

In general, effects on big game would include direct loss of habitat and forage and increased disturbance and noise from drilling, construction, operation, and maintenance operations. Disturbance of big game during the parturition period and on winter range can increase stress and may influence species distribution (Hayden-Wing 1980; HWA 2003). 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 (BLM 1990), crucial winter ranges for big game will be closed to construction and development from November 15 through April 30. This partial closure of crucial winter ranges would reduce disturbance to wintering big game. This partial closure would also limit the potential for poaching and harassment of big game species wintering in the area. Recreational use of the area and production would not, however, be affected by the partial closure.

Effects on big game are expected to be minimal, as the Project Area represents less than one-tenth of a percent of the winter or year-long range for any species (HWA 2003) (Figure 3-1). No long-term loss of habitat is expected once construction is complete, and big game species are expected to return to the area.

Less than 11 acres of the Project Area has been designated as crucial winter range for pronghorn antelope. Furthermore, no project-related disturbance is scheduled within the crucial winter range. 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 pre-disturbance activity patterns. Reeve (1984) found that pronghorn acclimated to increased traffic and machinery as long as they moved in a predictable manner (HWA 2003). Overall, no noticeable effects on the antelope population that inhabits the Project Area are expected, provided mitigation measures contained in this document, the RMP, and the Interim Drilling Policy are implemented.

#### **4.8.1.3. Upland Game Birds**

No noticeable effect on the population of greater sage-grouse is expected, provided all applicant-committed and BLM-required mitigation measures described in Chapter 2 are followed. Production facilities at well sites often act as raptor perches, increasing predation on greater sage-grouse and other wildlife. Use of low-profile structures and anti-perching devices will mitigate these potential effects.

The four leks where recent greater sage-grouse activity has been noted are within the two mile nesting and brood rearing habitat buffers for the project area. These seasonal timing stipulations will prevent operations (March 01 to June 30) in the proposal area unless exceptions are requested and obtained. None of the leks on federal ground are within ¼ mile of well sites. One lek on private surface adjacent to an existing road and within ¼ mile of an existing well pad may be adversely affected by this project. This is Hogback lek which has no record of recent activity, but is maintained as active on the Wyoming Game & Fish database.

Recent surveys found two active leks south of the pod, and one is located south of the Red Rim Lateral Pipeline and access road in the Project Area. Wyoming Game and Fish records show all portions of the proposal area are within two miles of a recorded lek. Suitable habitat for the greater sage-grouse is abundant. Under the Proposed Action, 132.7 acres of the Wyoming big sagebrush vegetation cover type would be disturbed during construction and 41.1 acres would be disturbed in the long term. This amount of habitat disturbed would be minimal, considering the quantity available in the Project Area. However, greater sage-grouse can be affected by other activities associated with natural gas development, including increased human activity and traffic disturbance and noises from pumping or compressor engines. Increased noise that occurs in sensitive resource areas could affect the ability of greater sage-grouse to mate. Careful siting of noise sources, addressed in applicant-committed and BLM-required mitigation measures in Chapter 2 and in the MSUP, would result in minimal effects on greater sage-grouse.

The proposed market access pipeline would pass through 4.4 miles of potential nesting habitats (within the 2-mile buffers) of two active greater sage-grouse leks. These leks are south of the Project Area and located south of the pipeline and access road. Controlled Surface Use (CSU) stipulations to restrict disturbance of greater sage-grouse leks apply within a ¼-mile buffer around active leks on public lands. There is a greater sage-grouse lek within ¼ mile of an existing well pad on private surface. No areas of CSU associated with greater sage-grouse leks are located in the Project Area on public lands. The entire Project Area is included within the 2-mile buffer of an active greater sage-grouse lek. Activity in such areas is limited by timing stipulations between March 1 and June 30 for the protection of nesting greater sage-grouse. As a result, mitigation measures must be followed to protect this area, especially during periods when greater sage-grouse mating could be affected by noise associated with the project.

The potential effects of the project on avian species would be nest abandonment and reproductive failure caused by project-related disturbance and increased noise. Other potential effects involve increased public access and subsequent human disturbance that could result from new construction or production, and small, temporary reductions in populations of prey for raptors. An active golden eagle nest was found 0.6 miles west of the pod. Approximately 5 miles of the proposed pipeline route were not included in a May 2001 survey for raptors, as the area is located outside the area flown for the Atlantic Rim EIS study area. In addition, inactive raptor nests were found within 1 mile of the Project Area (Chapter 3). These nests should be monitored each spring for subsequent use by raptors. If these nests do become active, avoidance and mitigation measures must be followed to protect this area. The Companies will consult with RFO to identify any additional raptor surveys that are needed before construction of the pipeline begins. If an exception is requested during the raptor stipulation period, BLM will conduct an inventory of the particular nest to determine the status of the nest (active vs. inactive). Aboveground power lines are not included in the project and are therefore not considered here.

#### **4.8.1.4. Raptors**

No effects on breeding raptors would be expected, provided avoidance and mitigation measures are followed. Mitigating measures for oil and gas projects contained in the RMP state that no activity or surface disturbance would be allowed near nesting habitat for raptors from February 1 through July 31. The size of the restrictive radius and the timing on the restriction may be modified, however, depending on species of raptor and whether the nest would be within the line of sight of construction. No effects on breeding raptors would be expected, provided that avoidance and mitigation measures in this document, the RMP, and the Interim Drilling Policy are followed.

#### **4.8.1.5. Fish**

There would be no potential effects to fish downstream because the Great Divide Basin is a closed basin, and no water would enter the Colorado or North Platte River Systems.

#### **4.8.1.6. Threatened and Endangered Species - Wildlife and Fish**

##### **4.8.1.6.1. Wildlife Species**

Black-footed Ferret. Implementation of this project is not expected to affect black-footed ferrets.

Canada Lynx. The Canada lynx is not expected to occur within the Project Area because of the lack of potentially suitable habitats. Thus, implementation of the project is not expected to affect Canada lynx.

#### **4.8.1.7. Species of Concern - Wildlife and Fish**

##### **4.8.1.7.1. Wildlife**

Effects on BLM wildlife species of concern could occur as a result of loss of habitat or displacement caused by increased noise. No noticeable effects would be expected based on the relatively small size of the Project Area, the inherent mobility of the species of concern, and the abundance of nearby potentially suitable habitats. However, the lack of effects assumes that the avoidance and mitigation measures described in Chapter 2, the RMP, and the Interim Drilling Policy would be followed.

##### **Mountain Plover**

Potential habitat for mountain plovers (HWA 2003) was found in the Project Area, but surveys did not detect the presence of mountain plovers. Implementation of the project is not expected to affect mountain plovers; however, surveys should be completed in areas of potential habitat before construction begins. Timing restrictions may apply in areas of suitable mountain plover habitat ([Figure 3-1](#)).

#### **4.8.1.7.2. Fish**

There are no BLM sensitive fish species in the Great Divide Basin or the Platte River system.

#### **4.8.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on wildlife and fisheries or threatened, endangered, or sensitive species likely would be similar to the effects that would occur from implementation of the Proposed Action. The facilities proposed for Alternative 2 are identical to the Proposed Action and would result in the same short- and long-term disturbances to wildlife habitat.

#### **4.8.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on wildlife or fisheries or threatened, endangered, or sensitive species would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.9 RECREATION**

#### **4.9.1. Alternative 1 - Proposed Action**

Recreational access to the checkerboard land pattern in this area is at the discretion of the private land owner. Impact to the recreational use of the Project Area would involve a 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 would be highest during the general deer and elk season, when the most hunters are in the area. The proposed drilling schedule would limit displacement to one season. Hunters would relocate to other areas near the project if landowners allow access.

Undisturbed landscapes, isolation, and solitude are important to some recreationists. Project-related disturbances that impair the characteristic landscape could also contribute to a decline in the quality of the recreational experience for these users. The recreational experience could be less satisfying than under the pre-disturbance conditions described in Chapter 3. The effects would diminish substantially after drilling and construction are completed. Some long-term displacement of hunters and other recreationists likely would occur under the project. Human access and activities would increase under the project with the improved and new access roads. Overall, effects on the recreation resource would be minimal because of the short-term nature of drilling and construction and the concentrated locations of these activities.

Proposed OHV uses at Hogback Lake would not be affected by interim development activities because it is unlikely that the surface discharge of produced water would reach Hogback Lake. The proposed delivery pipeline would be constructed near Hogback Lake, but would not conflict with or reduce OHV use.

Recreationists on the Continental Divide National Scenic Trail adjacent to WY 71 would experience temporary disturbance from the sight and noise of construction of the market access pipeline for the project. The visual intrusion of construction and construction-related noise could reduce the quality of the recreational experience in general. However, effects would be short-term and generally would be restricted to the immediate vicinity of the work. There would be no interference with recreation once construction is completed and the construction ROW is reclaimed. The appearance of the reclaimed ROW would be similar to the existing pipeline ROW, as assessed in the section on Visual Resources.

The proposed pipeline is adjacent to Carbon County Road 605 along most of the 10.2-mile length. The pipeline would cross the road at the north end of Coal Mine Ridge, nearly 2 miles southwest of Rawlins. Construction at the road crossing would inconvenience recreationists who use the roads to gain access to recreational opportunities in the area. However, any road closures would be temporary, occurring for a brief period. Road access would be restored to existing uses after construction is completed.

#### **4.9.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on recreational opportunities in the Project Area likely would be similar to the effects that would occur under the Proposed Action. The facilities proposed for Alternative 2 are identical to the Proposed Action and would result in the same short- and long-term disturbances to public access and the Continental Divide National Scenic Trail.

#### **4.9.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on recreation resources or use would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts. The market access pipeline would not be approved under the No Action alternative, so there would be no effect on recreationists in the Project Area or on the Continental Divide National Scenic Trail from construction of the pipeline.

### **4.10 VISUAL RESOURCES**

#### **4.10.1. Alternative 1 - Proposed Action**

As noted in Chapter 3, Affected Environment, the Project Area is not pristine. ORV tracks are evident throughout the area and are used by ranchers, recreationists, and traffic

related to mineral development. The Proposed Action would be consistent with the existing VRM Class III objectives in the Project Area.

Short-term impacts to the visual resource associated with construction and drilling in the Project Area 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. Additional impacts may occur from fugitive dust produced by construction.

The Project Area would not be visible from I-80 or WY 71. Potential viewers of the contrasts described would be few and would include hunters and other recreationists, ranchers, and oil and gas field workers.

Construction of the Red Rim lateral pipeline would be visible to motorists on WY 71. A segment of the Continental Divide National Scenic Trail is located along the highway. This segment provides a link to segments of the trail that are accessible to recreationists on public lands. Short-term construction on the pipeline would be within an existing ROW in foreground views that would be visible to motorists and recreationists on the trail route.

The severity of impact with the BLM VRM rating system 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 is highly visible to potentially large numbers of viewers.

The short-term impacts would be considered acceptable in a Class III area. The contrasts during construction would be seen by relatively few viewers and would be visible only for a short time.

Permanent production facilities, as described in Chapter 2, would remain after well drilling is completed. The presence of permanent production facilities would create continued impacts over the long term.

These facilities would create contrasts in line, form, color, texture, and overall pattern in the landscape that would remain for the duration of the project. However, as noted for short-term impacts, these contrasts would not be visible to many viewers. The level of contrast would not exceed Class III standards if the mitigating measures described in Chapter 2 are implemented. Levels of contrast would, however, detract from the recreation experience of visitors to the Project Area.

Additional facilities, such as access roads, would be required to service production facilities. Roads would create additional contrasts in line, color, and texture. The level of contrast would not exceed Class III standards with appropriate mitigation measures, as described in Chapter 2. However, contrasts could diminish the experience of motorists and recreationists.

There would be no long-term impacts to the visual quality of the viewshed from the Red Rim delivery pipeline as seen from the Continental Divide National Scenic Trail. Once

the pipeline is installed and the construction ROW is reclaimed, the appearance of the ROW would be similar to the existing ROW that is currently within the viewshed of the highway and the trail.

#### **4.10.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on the visual quality of the Project Area likely would be similar to the effects that would occur under the Proposed Action. The facilities proposed for Alternative 2 are identical to the Proposed Action and would result in the same short- and long-term disturbances to visual resources.

#### **4.10.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on visual quality or visual resources would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts. The market access pipeline would not be approved under the No Action alternative, so there would be no impacts to the visual quality of the Project Area from pipeline construction or to recreationists on the Continental Divide National Scenic Trail.

### **4.11 CULTURAL RESOURCES**

#### **4.11.1. Alternative 1 - Proposed Action**

Reduction of direct and indirect adverse effects to historic properties through avoidance or mitigative measures (data recovery or recordation) can be accomplished on a case-by-case basis. No identified sites are located within potential disturbance areas. Site 48CR3648 represents the route of the Rawlins-Baggs Stage Road and is considered eligible for inclusion in the National Register of Historic Places. The portion of the Rawlins-Baggs Stage Road that passes through the project area is considered a contributing segment to the eligible site (Darlington 2003).

Direct impacts would result primarily from construction-related activities. Activities that could affect cultural resources would include grading well pads and associated facilities and construction of roads and pipelines. Sites located outside the Project Area would not be directly affected by construction

Based upon the current Great Divide Resource Area Record of Decision and Approved Resource Management Plan, surface disturbance mitigation guideline, surface disturbance will be prohibited within either one-quarter mile or the visual horizon (whichever is closer) of historic trails. A viewshed analysis of the project area reveals section 28, T.20N. R.89W. is the only portion of the project area that falls within the quarter mile viewshed of the Rawlins-Baggs Stage Road.

Direct visual impacts to the trail would result from the construction of roads, pipeline corridors, and well locations. A lasting visual impact from the placement of tank covers over wells would adversely impact the visual integrity of the trail. Currently, the only visual intrusions to the Rawlins-Baggs stage road are bladed roads which have significantly re-vegetated. Any construction within the view shed of the Rawlins-Baggs Stage Road would be an adverse direct impact to the contributing segment.

Block surveys have been completed in the Project Area, as required by the Interim Drilling Policy. Identification and avoidance or mitigation of eligible sites before disturbance would minimize impacts to these cultural resources. Previously unidentified buried sites could be impacted during construction activities. Implementation of measures described in Chapter 2 would reduce impacts and minimize the loss of cultural resource information.

Mitigation measures could include avoidance or monitoring of the historic properties. The proposed impact at the sites would be moved to prevent disturbance during construction or a qualified archaeologist would monitor construction of the proposed impact location. All recommendations are subject to approval and alteration by the BLM RFO archaeologist. In the event that buried cultural materials are discovered during construction, those activities would be halted until a qualified archaeologist visits the site and evaluates the find. If the proposed action is modified, an additional cultural resources inventory for the new area of proposed disturbance may be required.

#### **4.11.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on cultural resources in the Project Area likely would be similar to the effects that would occur from implementation of the Proposed Action. The locations of facilities proposed for Alternative 2 are identical to the Proposed Action and would result in the same potential disturbances to cultural resources that have been identified.

#### **4.11.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on cultural resources would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.12 SOCIOECONOMICS**

#### **4.12.1. Alternative 1 - Proposed Action**

Socioeconomic impacts of the project would be largely positive. The project would enhance regional economic conditions and generate revenues from local, state, and federal government taxes and royalties. The relatively small, short-term drilling and field

development workforce would not create noticeable effects on population or increase in demand for temporary housing or local government services.

The project would involve capital investment in gas wells, injection wells for produced water, gathering systems, compression stations, and other field infrastructure. The project would require between 16 and 36 workers for drilling and field development over a 30- to 45-day period and one operations worker for as much as a 20-year period (Table 2-2).

Development and operation of the project 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 Companies 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 project may create up to three new indirect jobs (defined as jobs that become available in support industries as a result of the project).

#### **4.12.1.1. Oil and Gas Activity in Carbon County**

Successful completion of the project would increase production of natural gas in Carbon County, especially during the first several years of the project. To date in 2003, 225 APDs have been issued for Carbon County. The 14 wells associated with the project would be about 6 percent of the APDs received in 2003 for the county. However, the relatively short drilling time and low requirements for infrastructure and labor associated with gas development would not result in a substantial increase in drilling or employment in the county.

Economic effects on grazing would include small losses of forage caused by temporary and long-term disturbance until revegetation is successful. Temporary disturbance could result in a small reduction in grazing. If grazing does not increase accordingly in nearby areas, the associated economic activity in Carbon County could be lost, although the economic impact of the loss of four AUMs would be small. A recent University of Wyoming study estimated that each AUM of cattle grazing was worth \$65.07 in total economic impact in the region (UW 2000). Using this estimate, the proposed development could result in a loss of \$260 annually for the life of the project.

#### **4.12.1.2. Population Effects**

Population effects of the project would not be noticeable. Some of the skills and services required for the project are available in the local labor pool, although the recent increase in oil and gas drilling in southwest Wyoming has absorbed much of the available workforce. Of the short-term demand for 16 to 36 drilling and field development workers, some would likely be contractors from other areas of Wyoming (such as Rock Springs, Gillette, and Casper) and from northern Colorado. The remainder would be hired from the local workforce. Given the short duration of the drilling phase (less than 2 months), most nonlocal workers who would relocate to Carbon County would be single.

Nonlocal workers would attempt to obtain temporary housing as close to the work site as possible, most likely in Rawlins. Workers who are not able to secure temporary housing in Rawlins might locate in Sinclair, Hanna, Saratoga, or other communities further away. Given the current level of drilling and field development in Wamsutter, it is unlikely that drilling and field development workers for the project would find temporary housing in that community.

Based on the relatively small workforce and short-term nature of the drilling and field development phase of the project, area businesses could accommodate the increase in economic activity with existing employees.

#### **4.12.1.3. Temporary Demand for Housing**

Existing resources could accommodate the relatively small demand for temporary housing during drilling and field development under the project. Demand may be accommodated in nearby Rawlins, which provides the largest pool of temporary housing in Carbon County. Additional temporary housing is available in Wamsutter, Baggs, Rock Springs, and Craig, depending on seasonal considerations and other activity in the oil and gas industry.

#### **4.12.1.4. Law Enforcement and Emergency Response**

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

#### **4.12.1.5. Fiscal Effects**

If the productive life of each successful well in the project is 15 years and produces on average nearly 100 MMCF per year of methane, which is sold for \$2.50 per MCF, the sales value of each well would be about \$3.5 million over the life of the project. If five federal wells within the Project Area were productive, the federal royalties would exceed \$2 million. One well is on federal land, but the mineral is owned by the State of Wyoming. Royalties to the State of Wyoming have been estimated using 16.67 percent of the estimated sales volume for each well. The project is therefore expected to generate more than \$600,000 in state royalties over the life of the well. State royalties are deposited in the permanent fund and are used for schools and public institutions. The severance tax collected by the State of Wyoming on 14 producing wells would exceed \$3 million. The sales and use taxes collected by the state and by Carbon County also would exceed \$3 million. Ad valorem taxes would contribute more than \$600,000 to Carbon County. These values are approximate, are based on assumptions, and are intended to indicate the order of magnitude of possible fiscal effects.

#### **4.12.1.6. Environmental Justice**

The project would not directly affect the social, cultural, or economic well being and health of Native American, minority or low-income populations. The Project Area is relatively isolated from population centers, so no populations would be affected by physical or socioeconomic impacts from the project.

#### **4.12.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

The production value of gas wells under Alternative 2 would be the same as for the Proposed Action; therefore, the beneficial economic impacts at the county, state, and federal levels likely would be similar to the impacts that would occur from implementation of the Proposed Action. Effects on other socioeconomic factors, including employment, wages, housing, and environmental justice, in Carbon County would also be similar to the effects under the Proposed Action.

#### **4.12.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No federal mineral royalties would be gathered and no additional socioeconomic effects would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.13 TRANSPORTATION**

#### **4.13.1. Alternative 1 - Proposed Action**

##### **4.13.1.1. Federal and State Highways**

The project would increase the volume of traffic on highways that provide access to the Project Area and on county and operator-maintained roads within the Project Area. These increases would result from movement of project-related workers, equipment, and materials to and from the Project Area for drilling, field development, well service, field operations, and reclamation.

Based on these assumptions and estimates, the incremental increase in area traffic associated with the project would not result in a significant deterioration of level of service for I-80 (Rounds 2000). Based on the relatively small increase in traffic and short duration of traffic caused by the project during the drilling and field development phase, it is unlikely that the project 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 that could be attributable to the project is negligible.

##### **4.13.1.2. County Roads**

The project would increase traffic on Carbon County Road 605 (Twentymile Road), which provides the primary access into the Project Area from I-80. The relatively small, short-term increases in traffic are unlikely to result in significant deterioration of the road or substantial increases in accidents. The primary effects of traffic related to the Proposed Action on county and BLM roads would be to accelerate requirements for maintenance on the segments that are not maintained by the Companies. The revenues related to the Proposed Action generated for county government, which are described under the section

on Socioeconomics, may offset the cost associated with accelerated road maintenance on county roads.

Increased traffic may raise the potential for accidents that involve vehicles and stock animals, although the slower speeds required by the condition of county roads tend to minimize their frequency (Warren 2000). Coordination with livestock operators during sensitive periods (such as cattle movements and calving season) could further reduce the potential for accidents that involve vehicles and stock animals.

#### **4.13.1.3. Internal Roads**

The Companies would be responsible for constructing and maintaining new and improved roads within the Project Area; therefore, no fiscal impacts are anticipated for the BLM or Carbon County.

#### **4.13.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on transportation likely would be similar to the impacts that would occur from implementation of the Proposed Action. Access into the Project Area from I-80 and Carbon County Road 605 would be the same as the Proposed Action. Internal roads constructed within the Project Area also would be the same as under the Proposed Action.

#### **4.13.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on transportation would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.14 HEALTH AND SAFETY**

#### **4.14.1. Alternative 1 - Proposed Action**

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

##### **4.14.1.1. Occupational Hazards**

The statistical probability of injuries is low during the drilling and field development phase of the project, when a peak of 36 workers may be employed. The annual statistical

probability of injuries is minimal during field development because only one worker would be employed.

The BLM, OSHA, USDOT, WOGCC, and WDEQ each regulate certain safety aspects of oil and gas development. Adherence to relevant safety regulations by the Companies and enforcement by the agencies would reduce the probability of accidents. Additionally, in light of 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 project would mainly be limited to employees and contractors rather than the public.

#### **4.14.1.2. Pipeline Hazards**

The risk of pipeline failure would increase with increasing length of the gathering system or market access pipeline. The relatively small amount of new pipeline associated with the project, coupled with the low probability of failure and the remote nature of the Project Area, would result in minimal risk to public health and safety. Pipeline markers posted on the rights of way for the pipelines would reduce the likelihood that pipeline ruptures would be caused by excavation equipment, especially near road crossings or areas likely to be disturbed by road maintenance.

#### **4.14.1.3. Other Risks and Hazards**

Risks to public health and safety are not expected to increase under the project. Impacts to highway safety are discussed under the section on Transportation of this document. Impacts associated with sanitation or the materials used in CBNG development would be prevented or reduced by the mitigation measures described in Chapter 2.

The risk of fire in the Project Area could increase under the project but would remain low. Fire is a potential impact associated with construction, industrial development, and the presence of fuels, storage tanks, natural gas pipelines, and gas production equipment. This small risk would be reduced further because facilities would be situated on pads and in locations that are graded and devoid of vegetation. 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 procedures also would minimize the risk of fire. Risk of wildfire would be heightened where construction places welding and other equipment near native vegetation. However, the risk to the public would be minimal because of limited public use and presence in the Project Area. A small increase in risk to area fire suppression personnel would be associated with the project.

#### **4.14.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on health and safety in the Project Area likely would be similar to the effects that would occur from implementation of the Proposed Action. The locations of facilities proposed for Alternative 2 would be the same as under the Proposed Action and would

result in the same level of hazard to health and safety that would occur under the Proposed Action.

#### **4.14.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional effects on public health or safety would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

### **4.15 NOISE**

#### **4.15.1. Alternative 1 - Proposed Action**

Noise associated with construction and natural gas production operations can create a disturbance that affects human safety (at extreme levels) or comfort and can modify animal behavior. Identifying the activities that may exceed the maximum standards is not a simple issue. Perception of sound varies with intensity and pitch of the source, air density, humidity, wind direction, screening or focusing by topography or vegetation, and distance from the observer. Noise levels that exceed the 55-dBA maximum standards can occur at construction and production operations. Noise levels around a compressor engine contained in an enclosed building would be below 55 dBA at an estimated 600 feet from the compressor site (BLM 1999b). Construction-related impacts would be short term, lasting only as long as construction was under way 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 result of production facilities.

The density of the human population is low in the Project Area; therefore, construction and development operations under the project would be sufficiently distant from residences that none would be affected by construction or development operations. Overall, noise produced by construction and support equipment during periods of peak activity would be moderate because of the dispersed and short-term nature of these activities.

#### **4.15.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Effects on noise from activities proposed for Alternative 2 likely would be the same as the effects that would occur from implementation of the Proposed Action. The facilities proposed for Alternative 2 are the same as the Proposed Action and would result in the same level of noise.

### **4.15.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, the coordinated plan of development described under the Proposed Action would not be approved. No additional noise effects would be expected to occur if the proposed wells are not drilled. Future mineral development in the Project Area would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

## **4.16 CUMULATIVE IMPACTS**

### **4.16.1. Alternative 1 - Proposed Action**

Cumulative impacts would result from the incremental impacts of the project (Red Rim POD) when added to non-project impacts that result from past, present, and reasonably foreseeable future actions (RFFAs). Reasonably foreseeable development is any development likely to occur within the Project Area (Red Rim POD), or cumulative impact assessment (CIA) area, within the next 5 years. CIA areas vary between resources and are generally based on relevant landscapes, resources, projects, or jurisdictional boundaries.

The only major resource development currently proposed near the Project Area (Red Rim POD) is the other exploration planned under the Interim Drilling Policy for the Atlantic Rim EIS study area ([Appendix A](#)). Thus, the effects of the Red Rim POD (described in this chapter) would not overlap cumulatively with the effects of current or reasonably foreseeable projects or activities other than interim drilling, grazing, and existing or planned prescribed burns within the Atlantic Rim EIS study area.

The Interim Drilling Policy allows a maximum of 200 wells within the Atlantic Rim EIS study area for research and exploration during the interim period while the Atlantic Rim EIS is prepared. Wells would be allowed only in the nine pods identified by the Companies. In addition, a maximum of only 24 wells will be allowed within any pod, even if multiple zones are to be evaluated. Total distance between pods at the north and south ends of the Atlantic Rim EIS study area is about 40 miles. The distances between the individual pods vary, from 1.5 miles to more than 6 miles. The Red Rim POD is part of the 200-well interim drilling project.

Existing natural gas development under the Interim Drilling Policy in the Atlantic Rim EIS study area includes wells and related facilities that have been developed in the Sun Dog, Cow Creek, Blue Sky, and Red Rim areas. There have been 44 natural gas wells drilled in these areas, along with related facilities that include injection wells, roads, corridors for gathering lines and utilities, compressor stations, pumping stations, and water handling facilities. The cumulative long-term disturbance associated with existing gas wells and related facilities in the Atlantic Rim EIS study area is projected to be 74 acres.

Reasonably foreseeable development in the Atlantic Rim EIS study area includes development of the Red Rim area and the remaining well pods referenced in the Interim Drilling Policy. Considering the wells that already exist (44), the proposed wells in the Red Rim area (9), the reasonably foreseeable wells in the Doty Mountain area (24), and the 200-well limit imposed by BLM under the Interim Drilling Policy, the remaining RFFAs associated with interim drilling would include 123 gas wells that would be located in the remaining pods within the Atlantic Rim EIS study area.

Surface-disturbing activities for the wells mentioned in the Interim Drilling Policy may affect an estimated 650 acres (short- and long-term disturbance), including an estimated 60 miles of new access roads. (New roads associated with interim drilling will likely be in the form of spurs from the existing network of roads.). In addition, an estimated 100 miles of water and gas flowlines could be required.

The long-term disturbance from gas wells and facilities associated with the 200 wells mentioned in the Interim Drilling Policy during the life of the proposed wells, after short-term disturbance is reclaimed, would include existing wells and facilities (74 acres), proposed wells and facilities in the Red Rim area (25 acres), RFFAs in the Doty Mountain area (29 acres), and RFFAs in the remaining well pods (220 acres). The cumulative long-term disturbance associated with the 200 wells mentioned in the Interim Drilling Policy would likely affect an estimated 348 acres. These 348 acres would be reclaimed after the wells have been found not to produce or when they cease to produce at some time in the future.

Other past or existing actions in or near the Project Area (Red Rim POD) that continue today and have influence include the road network, oil and gas wells that are not part of the Red Rim POD, ranching and livestock facilities (including fences, stock watering facilities, ranch houses, power lines, and pipelines), and prescribed burns.

To date, 59 oil and gas wells that are not part of the 200 wells mentioned in the Interim Drilling Policy have been plugged and abandoned or are in various stages of reclamation; 37 wells that are not part of the 200 wells mentioned in the Interim Drilling Policy are in various stages of completion. An estimated 337 acres of cumulative, long-term disturbance from wells and facilities that are not part of the 200 wells mentioned in the Interim Drilling Policy are associated with development of oil and gas resources in the Atlantic Rim EIS study area.

The total cumulative long-term disturbance anticipated in the Atlantic Rim EIS study area from oil and gas development, including the 200 wells mentioned in the Interim Drilling Policy and other wells in the Atlantic Rim EIS study area that are not part of the 200 wells mentioned in the Interim Drilling Policy, is about 700 acres. This disturbance would be associated with 296 wells and related facilities.

#### **4.16.1.1. Geology, Minerals, and 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. Therefore, no incremental increase in cumulative impacts

associated with geologic hazards would occur. The cumulative impacts to the surface geologic environment would be minimized if the terms of the Interim Drilling Policy are followed and proper techniques for well pad and facility siting, construction, and reclamation are used. Proposed actions and RFFAs would require restoration of disturbed lands and would minimize alterations to topography. Standard stipulations and project- and site-specific construction and reclamation procedures would be required for additional development on federal lands. These measures would further minimize cumulative impacts on the surface geologic environment.

With the exception of natural gas, no major surface mineral resources would be affected by the RFFAs. Subsurface mineral resources are protected by the BLM and WDEQ policies on casing and well bore cementing.

#### **4.16.1.2. Air Quality**

Cumulative impacts from emissions that would result from past oil and gas activity and the proposed wells mentioned in the Interim Drilling Policy would be much the same as were found on similar projects such as the Continental Divide. Emissions from oil and gas facilities approved before 1999 were included in the 3,000-well air quality analysis prepared for the Continental Divide EIS, although only 2,130 wells were approved. The emissions from the wells mentioned in the Interim Drilling Policy have been incorporated under the air quality model completed for the Continental Divide project.

RFFAs, including the relatively small number of exploratory wells and facilities mentioned in the Interim Drilling Policy, would generate only a small amount of air pollutants. Some temporary effects on air quality would likely occur in the immediate vicinity of interim drilling, created by particulate matter and exhausts from vehicles and equipment. These effects would be local and would be dispersed by the prevailing winds from the west. The effects on air quality would be minimized through dust abatement practices. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, and vehicle emissions from recreation traffic, were not modeled, but would generate only a small amount of air pollutants.

No noticeable deterioration in visibility would occur at Class I or sensitive Class II wilderness areas located within 100 miles of interim drilling (Mount Zirkel, Rawah, Savage Run, Platte River, Huston Park, or Encampment River). Furthermore, no noticeable deterioration in visibility would occur at the Dinosaur National Monument in Colorado. Wind dispersion of the small quantity of air pollutants generated by RFFAs would likely eliminate formation of regional haze or acid deposition.

#### **4.16.1.3. Soils**

The CIA area for soils includes the 219,500-acre portion of the Muddy Creek Watershed that overlaps the Atlantic Rim EIS study area. Cumulative impacts include effects on soil from ongoing exploration and development, recently constructed projects, and RFFAs. Cumulative long-term disturbance consists of about 700 acres, or 0.3 percent of the

Muddy Creek CIA area. Cumulative impacts on the soil resources would be minimal if all mitigation and avoidance measures were implemented.

Minimal effects on soils would be anticipated from the wells mentioned in the Interim Drilling Policy, with proper construction techniques, drilling practices, and the BMPs described earlier in this chapter in the section on Soils and Water Resources. Surface disturbance associated with drilling would increase the potential for erosion and sedimentation. This surface disturbance could include removing vegetation and stockpiling topsoil, road construction, or shallow excavations for drill pads or facilities. Implementation of BMPs during construction, operation, and reclamation to control erosion would minimize effects on soil resources. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, recreation use, and oil and gas development, would have a minimal effect on soil resources, provided BMPs for the management of these activities are implemented.

#### **4.16.1.4. Water Resources**

Water wells completed in water-bearing strata above or below the Almond Formation coal seams are not likely to be affected because of the thick confining layers. Water wells completed in the coal seams of the Almond Formation in close proximity (less than 1 mile) to the Project Area could be affected, but wells of this type do not exist. As described in Chapter 2, tests are under way to evaluate whether water from the coal seams in the Almond Formation contributes to the surface water system in the Colorado River Basin. It is highly unlikely that the Almond Formation is contributing to the Colorado River Basin, considering that the overpressured condition of the Almond Formation indicates it is isolated and has no communication with upper horizons.

Cumulative impacts to the groundwater resources within the Mesaverde Group would be limited to a decline in hydrostatic head within the coal aquifers that would result from development of gas wells during drilling. Existing impacts to groundwater resources within the Mesaverde Group that have resulted from prior development are so limited as to be nonexistent.

Minimal effects on groundwater aquifers or groundwater quality would be anticipated during interim drilling. These effects would be minimized with proper construction techniques, drilling practices, and BMPs similar to the applicant-committed and BLM-required mitigating measures that are described in Chapter 2. Current and future oil and gas exploration and development in the Project Area (Red Rim POD) must comply with federal and state environmental regulations. Specifically, wells would be completed in accordance with Onshore Order No. 2 and the recent BLM guidelines that reduce the potential for groundwater contamination.

Surface disturbance would increase the potential for erosion and sedimentation. This disturbance would be associated with related activities, such as removing vegetation and stockpiling topsoil, road construction, or shallow excavations for drill pads or facilities and existing burned areas within the CIA. Burns, prescribed and otherwise, would

increase the potential for erosion and sedimentation for the first 2 years after they occur, because of their effects on erosion of areas without vegetative cover.

Cumulative impacts to surface water resources would be maximized shortly after construction begins and would decrease over time in response to reclamation efforts. These impacts would then stabilize during the production and operation period, when routine maintenance of wells and ancillary facilities takes place. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, recreation use, and oil and gas development, would have a minimal effect on water resources, provided BMPs for the management of these activities are implemented. Additionally, all roads, well locations, and facility infrastructure would be regularly inspected and maintained to minimize erosion, sedimentation, and impairment of surface water quality.

Under the interim drilling policy, maximum development would increase surface flows in the Red Rim portion of the CIA area, provided NPDES permits for surface discharge are approved by the WDEQ and effluent limitations specified in the permits are achieved. Under the interim drilling policy, eight additional gas wells could be drilled in the Project Area (Red Rim POD). Surface discharge of the water produced from these wells would increase the mean annual flow in Hadsell Draw by 1.71 cfs, if approved by the WDEQ. Cumulatively, this discharge would not affect surface flows in the Muddy Creek portion of the CIA area, since there is no hydrological connection between surface waters within the Great Divide Basin, which is a closed basin, and external watersheds.

#### **4.16.1.5. Vegetation, Wetlands, and Noxious Weeds**

Cumulative impacts include impacts on vegetation and wetlands from ongoing exploration and development, recently constructed projects, prescribed burns where the sagebrush cover type has been converted to grass and bare ground, and RFFAs. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, recreation uses such as hunting and ORV use, and oil and gas development, would have a minimal effect on vegetation resources, provided BMPs for management of these activities are implemented.

An estimated 20,000 acres have been burned as a result of prescribed fires and 4,000 acres have been affected by wildfire over the past 15 years within a 500,000-acre area that includes the CIA. The objective in prescribed burns is not to burn all vegetation, but to leave mosaics of burned and unburned areas. These burned areas are in various stages of vegetative succession.

The distribution of plant species of concern is likely limited within the Atlantic Rim EIS study area by the lack of suitable habitat. The required application of existing FWS and BLM monitoring and mitigation measures would be expected to adequately protect threatened, endangered, and special status plant species. Thus, impacts to special status species would not be expected to occur.

#### **4.16.1.6. Range Resources and Other Land Uses**

RFFAs located within the Sixteen Mile Allotment include the proposed Red Rim. Based on the anticipated disturbance associated with these RFFAs, the cumulative disturbance would be 41 acres in the Sixteen Mile Allotment. The estimated 41 acres of cumulative long-term disturbance equates to a small reduction in available forage within the Allotment.

#### **4.16.1.7. Wildlife and Fisheries**

##### **4.16.1.7.1. Wildlife**

RFFAs, including the wells mentioned in the Interim Drilling Policy, are expected to have minimal cumulative effects on wildlife. Some wildlife species may be temporarily displaced by construction at well sites, access roads, and pipeline routes, but should return once construction is complete. Extensive suitable habitats for many species exist on adjacent lands and would support individual animals that may be temporarily displaced during RFFAs. Cumulative long-term effects on wildlife also are expected to be minimal, as most species would become accustomed to routine operation and maintenance. Only a small portion of available wildlife habitats within the Atlantic Rim EIS study area would be affected. As a result, the capacity of the area to support various wildlife populations should remain essentially unchanged from current conditions. No cumulative effects on wildlife, including threatened or endangered species or species of concern, are expected during interim drilling. This lack of effects is predicted provided avoidance and mitigation measures, lease stipulations, and provisions in the RMP are followed. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, recreation uses, and oil and gas development, would have a minimal effect on wildlife and fisheries resources, provided BMPs are implemented.

The CIA area varies with species, as indicated in the analysis. Disturbance of wildlife habitat that results from RFFAs, including the wells mentioned in the Interim Drilling Policy, would reduce the availability and effectiveness of habitat for a variety of common mammals, birds, and their predators. Initial phases of surface disturbance would result in some direct mortality to small mammals, would displace songbirds, and would cause a slight increase in mortality from increased use of vehicles. However, populations of small mammals and songbirds would quickly rebound to pre-disturbance levels after reclamation is complete because of the relatively high production potential of these species and the relatively small amount of habitat disturbed (0.006 percent of the Atlantic Rim EIS study area). Therefore, no long-term impacts to these populations are expected.

RFFAs, including activities associated with the construction phase of each of the pods mentioned in the Interim Drilling Policy, would likely temporarily displace antelope, mule deer, and elk; however, once construction is completed, they would likely return to pre-disturbance activity patterns. Elk winter range occurs in the Atlantic Rim EIS study area, but should not be affected by interim drilling. A small area of crucial winter range for pronghorn occurs in the Project Area (Red Rim POD), but would not be affected by development. The proportion of crucial winter range for the pronghorn within the Baggs

Herd Unit that would be affected over the short term would be 0.03 percent and 0.008 percent in the long term. Furthermore, construction on crucial winter range would be limited to May 1 through November 14. Prescribed burns are not expected to affect big game, as the burns would not alter the dominant forage. Provided that mitigation measures described in Chapter 2 and the Interim Drilling Policy are implemented, cumulative impacts to big game populations within the herd units are expected to be minimal.

Greater sage-grouse occupy the area where interim drilling is proposed year round and make seasonal use of the habitats. No exact figures are available on the amount of greater sage-grouse habitat that is available within the Atlantic Rim EIS study area, but the RMP identifies the area as included in the Baggs Habitat Management Plan. In this larger area, 160,500 acres of greater sage-grouse habitat was identified.

#### **4.16.1.7.2. Fisheries**

There are no fisheries resources present within the Great Divide Basin.

#### **4.16.1.8. Recreation**

BLM has not obtained statistics on historical use of the interim drilling area by recreation groups that could be used to identify trends in cumulative impacts on recreation use and displacement that could result from past or current activities and RFFAs. Cumulatively, overall impacts to the recreation resource are expected to be minimal, with some temporary displacement of hunters and recreationists during the short-term construction and drilling periods. Some long-term displacement of hunters and nonconsumptive users may occur, and levels of satisfaction may be reduced for any who might continue to use the area. The cumulative effects of other RFFAs in the Atlantic Rim EIS study area, such as prescribed burns that are planned, projected grazing of livestock, and oil and gas development, would have a minimal effect on recreation resources, provided BMPs for management of these activities are implemented.

#### **4.16.1.9. Visual Resources**

Existing visual qualities in the interim drilling area 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 people traveling through the area, particularly on back roads, is a modified landscape. Contrasts in line, form, color, and texture from development begin to dominate the viewer's experience. These conditions would increase the likelihood that viewers, particularly backcountry recreationists, would be dissatisfied with the visual component of the recreation experience. However, the cumulative impact of the wells mentioned in the Interim Drilling Policy and other RFFAs, such as grazing, recreation use, prescribed burns, and oil and gas development, on visual resources would still be consistent with the current VRM Class III designation, provided BMPs for these activities that are similar to the techniques described in Chapter 2 would be implemented.

#### **4.16.1.10. Cultural Resources**

Federal law and regulations protect cultural resources on public lands, including archaeological sites and historic properties. Cultural resources in the interim drilling area and adjacent lands already may have been affected by surface-disturbing activities, including ongoing natural gas development, road building, and construction of pipelines. Existing, proposed, or reasonably foreseeable development could add to the level of impact on cultural resources in the immediate area, unless inventories and protective or mitigation measures specified by BLM are followed. BLM has required cultural resource inventories before surface-disturbing activities can begin. These inventories have been used to identify sites potentially eligible for inclusion on the NRHP and to identify sites where BLM has required past exploration and development to avoid.

The potential for increased impacts on cultural artifacts would be minimized because Class III cultural resource inventories would be completed. Cultural resource inventories would have a beneficial, cumulative impact on the level of cultural information available about the interim drilling area.

It should be possible to eliminate direct and indirect adverse effects to historic properties from wells mentioned in the Interim Drilling Policy through avoidance or mitigation measures (data recovery or recordation) on a case-by-case basis. The potential for incremental increases in cumulative impacts would be circumvented by avoiding known cultural and historical sites in laying out drill sites, access roads, and pipeline corridors. Some unintentional damage to subsurface resources could occur during grading or excavation. However, implementation of resource protection and mitigation measures similar to the techniques described in Chapter 2 would protect these resources when they are discovered.

#### **4.16.1.11. Socioeconomics**

Southwest Wyoming is currently experiencing an increase in the pace and level of natural gas development. Drilling and field development are occurring near the interim drilling area (Atlantic Rim EIS study area), including Continental Divide/Wamsutter II, South Baggs, Mulligan Draw, Creston/Blue Gap, Hay Reservoir and, potentially, Desolation Flats. Although this surge in development will result in increased employment, income, and tax revenues in the region, it will also raise the demand for housing and for local and state government facilities and services. Rawlins is also experiencing some growth associated with the opening of a new prison facility.

Communities such as Rawlins and Rock Springs are still below the peak population levels of the early 1980s and have infrastructure and housing in place to accommodate some growth in population. Smaller communities near the Project Area (Red Rim POD), such as Wamsutter or Baggs, are struggling to accommodate the growth in population associated with development of the currently approved natural gas fields identified above. Neither the relatively small, short-term drilling and field development workforce nor the minimal operations employment and activity associated with the existing, proposed, or reasonably foreseeable development would add appreciably to cumulative demand for housing and local government services in the area. Drilling and field development

associated with these activities would be completed some time before interim drilling ends and the proposed Atlantic Rim Natural Gas Project begins.

#### **4.16.1.12. Transportation**

Oil and gas development in western Carbon County and eastern Sweetwater County would result in increased traffic on affected segments of I-80, WY 70, and WY 789. The condition of these highways is adequate to accommodate existing levels of traffic and some increases (Rounds 2000).

Currently known cumulative impacts on Carbon County Roads 605 and 608 would be limited to grazing and recreation and occasional traffic associated with oil and gas exploration. The increased traffic associated with drilling and field development for the 200 wells mentioned in the Interim Drilling Policy would accelerate maintenance requirements; however, revenues generated, which are described under the section of this chapter on Socioeconomics, may offset associated costs.

#### **4.16.1.13. Health and Safety**

Cumulative impacts to health and safety would be limited to effects associated with the 200 wells mentioned in the Interim Drilling Policy and to existing grazing and recreation. Cumulative impacts to health and safety are anticipated to be similar to the effects described for the project (Red Rim POD). Occasional traffic and activity associated with oil and gas exploration would slightly increase risks to workers and the public.

#### **4.16.1.14. Noise**

Cumulative noise impacts would be limited to the 200 wells mentioned in the Interim Drilling Policy and to existing grazing and recreation. Cumulative noise impacts are similar to the effects described for the project (Red Rim POD). Noise would result from ongoing construction, drilling, and production operations, including an estimated nine compressor stations, during interim drilling. Traffic would increase on existing transportation system roads within the area where interim drilling is planned, thus adding to the existing traffic noise. The additional traffic-related noise would be minimal given the current and anticipated low volumes of traffic and the dispersed nature of traffic and natural gas operations within the interim drilling pods. The locations of the interim drilling pods are dispersed, so that the noise from compressor stations would not likely be noticeable throughout the interim drilling area (Atlantic Rim EIS study area) ([Figure 1-1](#)). The distance between the pods also would minimize the overall impact of noise on visitors to the area; however, the cumulative additional noise from all RFFAs would combine to create an environment with an overall increase in sound disturbances. Applicant-committed and BLM-required mitigation measures for interim drilling, similar to the techniques described in Chapter 2 for the Red Rim POD, would result in minimal noise impacts.

#### **4.16.2. Alternative 2 - Injection of Produced Water from Federal Wells with Limited Beneficial Use**

Cumulative impacts under Alternative 2 likely would be similar to the effects that would occur under the Proposed Action. The facilities proposed for Alternative 2 are the same as the Proposed Action. The planned exploration and interim development under Alternative 2 would result in similar short- and long-term disturbances and similar cumulative effects on all affected resources. The principal difference between the Proposed Action and Alternative 2 is the different method of disposal for produced water from federal wells in the Red Rim POD. Levels of cumulative impacts would be similar under Alternative 2 for interim drilling associated with all pods, including the Red Rim POD, as for the Proposed Action.

#### **4.16.3. Alternative 3 - No Action Alternative**

Under the No Action alternative, without a coordinated plan of development for the Project Area (Red Rim POD), mineral development associated with interim drilling likely still would occur within the Project Area (Red Rim POD) and other pods within the Atlantic Rim EIS study area. However, reasonably foreseeable mineral development would occur under the guidelines of the RMP, by development of individual wells with no coordinated planning for the cumulative impacts.

The cumulative impacts could be similar to the effects of the wells mentioned in the Interim Drilling Policy described above under the Proposed Action, provided the consideration of drilling proposals individually, instead of in a coordinated plan, would not result in additional cumulative impacts. However, considering the difficulty of siting routes for pipelines in the coordinated plan for Red Rim so that impacts to important wildlife habitat were prevented, impacts almost certainly would be greater without a coordinated plan.

Cumulative effects of RFFAs other than the wells mentioned in the Interim Drilling Policy would be similar to the Proposed Action. Grazing, hunting, ORV use, other recreational activities, prescribed burns, and oil and gas development still would occur. These RFFAs would affect soil and water resources, vegetation, and socioeconomics of the Atlantic Rim EIS study area even if RFFAs associated with interim drilling did not occur, or did not occur under a coordinated plan. If no coordinated plan were developed, the potential benefits might be reduced or eliminated to grazing, soil and water resources, vegetation in riparian areas, and wildlife, that would be associated with a coordinated plan to reduce concentrated use of riparian areas by providing small quantities of produced water where it was previously not available.