

ENVIRONMENTAL CONSEQUENCES

This section of the EIS provides an analysis of the impacts (environmental consequences) that would result from implementation of the proposed Price CBM project and alternatives. Certain measures that would avoid or reduce impacts have been included in the Proposed Action as discussed in Chapter 2 and the Standard Surface Use and Operating Plan, Appendix 2D. The following impact assessment takes these measures into consideration.

The impact analysis addresses all impacts that would occur in the Project Area, for all categories of land ownership. However, BLM's decision on this project would only apply to federal lands. The impacts reported for non-federal lands may occur regardless of BLM's decision, and are mostly the same among the different alternatives, except for differences relating to well spacing. Impacts on non-federal lands are included to provide a full disclosure of effects for the complete project, and to support other environmental revisions and permitting associated with the project.

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

Introduction - A description of the type and range of potential impacts that could occur as a result of implementation of the alternatives.

Direct and Indirect Impacts - An area-specific and site-specific impact assessment relative to the CBM gas production alternatives. This section quantifies and describes the impacts to the resource/ discipline.

Where applicable, impact significance criteria

are described. These criteria represent the threshold or magnitude at which an impact would be considered significant, thus warranting special attention, such as special mitigation. These criteria are based on criteria from government regulatory standards, available scientific documentation, previously prepared environmental documents, and the professional judgment of resource specialists.

Impacts Summary - A comparison of direct and indirect impacts that would occur under each alternative and between alternatives. A summary comparison of alternatives is also provided in Table 2.8-2.

Mitigation - Additional measures that could be applied to avoid or reduce impacts, above and beyond the environmental protection measures described in Chapter 2. Mitigation measures specified in this summary would be enforceable only on federal lands and only if they are included in the ROD.

Unavoidable Adverse Impacts- Impacts that are unavoidable and cannot be mitigated.

Certain issues and environmental consequences were considered, but not analyzed in detail for each alternative. Refer to Section 1.6.2 for a discussion of these issues.

4.1 GEOLOGY

4.1.1 Introduction

The purpose of the Proposed Action is to remove all recoverable coalbed methane within a portion of the Project Area. The recovery of the methane is considered the only significant

consequence to geologic resources. Other potential impacts, such as creating geologic hazards, precluding development of other mineral resources, or disturbing paleontological resources, were considered, but not analyzed in detail by alternative. (Refer to Section 1.6.2.)

4.1.2 Direct and Indirect Impacts

4.1.2.1 Proposed Action

Under the Proposed Action, for the 601 new and 97 existing wells, peak gas production is estimated to be 268 MMcf/day and total production would be 991 bcf for the 30-year project life. This estimate is based on a zero-time plot analysis using production history from the existing RGC wells. CBM gas production should increase the first few years, then gradually decline. For purpose of analysis, it is assumed that annual production would be approximately 58 bcf. This represents approximately five times the volume of CBM produced in the state of Utah in 1995 which was 12.2 bcf (Petzet 1996). Annual CBM production in the U.S. in 1994 was 858 bcf (Stevens et al. 1996), approximately 15 times the production of the Proposed Action. However, CBM accounted for only five percent of U.S. natural gas production, and less than four percent of Utah's total gas production in 1994 (Petzet 1996).

The quality of the CBM gas is at least 97 percent pure methane based on the analyses of the existing production. The gas is considered pipeline-quality; no treatment, except water separation, is needed prior to distribution for

market via the Questar pipeline.

Coal thickness is an important factor in CBM production. Plate 10A illustrates the Ferron Coal isopach contours based on the Utah Geological Survey Open File Report 329. Wells with thicker coal seams usually produce gas at a greater rate and cumulative production per well is generally greater. Given the depositional history of the Ferron coals in a fluvial deltaic setting, coal thickness can change rapidly within short distances making predictions of thickness problematic. With the expected variable coal thickness in the Project Area, some of the proposed wells are expected to produce gas at greater rates than others. There is also a risk of drilling a dry hole in an area where the Ferron coal is absent. At this time, it is not possible to predict with accuracy which proposed wells are more prospective than others given the overall lack of drilling in the 294 square mile Project Area.

This CBM production for the Proposed Action is an irretrievable commitment of resources as it will no longer be available for future use.

4.1.2.2 Alternatives A, B1, B2, C1, C2, D, and No Action

Production of CBM under all alternatives is an irretrievable commitment of the methane similar to the Proposed Action. The amount of gas produced will vary depending on the number of wells drilled in the field. The following is the anticipated gas production for the total project life of 30 years for each alternative:

Alter- native	Total Production Wells	Peak Gas Production MMcf/day	Total Gas Production bcf
Proposed Action	698	268	991
A	1,200	350	1,717
B1	533	227	753
B2	928	315	1,325
C1	647	257	918
C2	1,110	340	1,588
D	642	257	911
No Action	325	150	452

4.1.3 Impacts Summary

A summary comparison of impacts for each alternative is presented in Table 2.8-2. No adverse impacts to geologic resources are expected.

4.1.4 Mitigation

The BLM regulatory program, such as Onshore Oil and Gas Orders and Notices to Lessees ensures orderly and efficient gas production, and protection of the environment. No additional mitigation measures are required.

4.1.5 Unavoidable Adverse Impacts

No unavoidable adverse impacts are expected.

4.2 WATER RESOURCES

4.2.1 Introduction

Impacts to surface water quality may result from construction activities, accidental spills and crossing of streams by transportation corridors. Impacts to groundwater resources may result from withdrawing large quantities of water from the Ferron Sandstone and injecting this produced water into deeper formations (Curtis Formation, Navajo-Nugget Aquifer and Entrada Aquifer). As the significant majority of the production waters would be injected into the Navajo-Nugget Aquifer, the following impact analysis focuses on that aquifer. Impacts to existing water uses may also occur as a result of the fresh water requirements of the Proposed Action. A summary of project features related to water resource impacts is provided in Table 4.2-1.

Project-wide environmental protection measures that would minimize impacts to surface and groundwater resources include: RGC 2, 3 and 7; and BLM 1-5, 8-23, 29, 31-35. Best Management Practices (BMPs) used to protect water quality and related aquatic habitat will comply with the State of Utah “Nonpoint Source Management Plan for Hydrologic Modification” (Utah Department of Agriculture 1995).

For construction activities disturbing more than five acres, compliance with the Utah Pollutant Discharge Elimination System (UPDES) permit program would protect water resources from erosion and sedimentation and spills and leaks. A General Permit for stormwater discharges associated with construction activity would be obtained from the Utah Department of Environmental Quality. A stormwater pollution prevention plan would be developed identifying potential pollution sources and appropriate BMPs to reduce pollutants in stormwater runoff.

In addition, protection of water resources would be achieved through compliance with the Onshore Oil and Gas Order Nos. 1, 2, and 7 that specify surface and drilling requirements to provide safeguards and environmental protection of aquifers and surface waterbodies. A typical eight-point drilling plan for the proposed project, as required by Onshore Oil and Gas Order No. 1, is included in Appendix 2D.

Water resource issues that were considered, but not analyzed by alternative include the potential for community use of produced water, water rights owned by RGC, and the potential effect of CBM development on floodplains and springs. Refer to Section 1.6.2 for details.

4.2.2 Direct and Indirect Impacts

4.2.2.1 Proposed Action

Surface Water Quality

Surface water quality could be affected by general construction and reclamation activities as well as accidental spills and leaks. General construction activities involve the removal of vegetation, the exposure of soil surfaces and the compaction of soils. These disturbances which could potentially cause increases in runoff, erosion, and off site sedimentation would be minimized by the use of appropriate mitigation measures. Some sediments derived from the Mancos Shale and Mancos Shale derived soils, which are found over essentially the entire Project Area, may be very saline as discussed in Section 3.4.

The significance of any elevated TDS concentrations derived from these saline soils depends on the size of the disturbed area, salinity of the sediment involved, amount of runoff affected, proximity of the affected area to a body of water, and the effectiveness of erosion control measures. Places where transportation corridors or pipelines cross perennial streams would be the most susceptible to increased erosion and sedimentation.

Under the Proposed Action, approximately 4,095 acres would be disturbed. Approximately 2,353 acres would be disturbed over the long-term. The percentage of the Project Area that would be disturbed under the Proposed Action is only about 2.4 percent, including existing disturbance.

Locations close to springs and streams would

be especially sensitive to construction activities and to accidental leaks and spills. Locations where transportation corridors cross streams, especially perennial streams, would also be more prone to problems associated with construction activities. There are currently two perennial streams that are crossed by project roads. Under the Proposed Action, there would be approximately 20 additional locations where transportation corridors cross perennial streams. Roads are proposed within the 660-foot buffer zone for springs in 11 locations. Proposed wells would not be located within the buffer zone of either springs or the 100-year floodplain of perennial streams per BLM 4 and 5.

BMPs to control erosion such as temporary ditches, water bars and detention basins would be implemented in compliance with the UPDES stormwater permit program and the Utah Nonpoint Source Management Plan (State of Utah 1995). Specific BMPs to be implemented by RGC to minimize erosion include: hay bales, silt fences, riprap or gravel dikes, as appropriate, to trap sediment and disperse runoff into sheet flow to minimize channeling. Permanent stabilization controls for disturbed areas such as regrading and revegetation would be implemented in accordance with the BLM-approved reclamation plan.

RGC intends to use magnesium chloride ($MgCl_2$) on roads for dust control. Magnesium chloride is considered a very effective dust suppressant that would considerably reduce fresh water consumption. The concentration of the pre-mixed solution is 30 percent $MgCl_2$ and would be applied at a rate that places approximately one percent of $MgCl_2$ in the top two inches of soil per the manufacturer's specifications. The recommended application procedure ensures deep, even penetration to minimize leaching or runoff. Based on studies

conducted by the USFS (USFS 1981 and 1982) and the City of Boulder, Colorado (1993), water quality impacts from runoff salts are considered negligible. (Refer to response to Comment SG-1.79 for details). Considering the expected infrequent application rate and lack of data documenting salinity impacts, the use of magnesium chloride for dust control is not expected to adversely impact the quality of the Price River or tributaries.

As discussed in Section 4.4.2.1 and illustrated in Appendix 4A, ongoing soil loss in the Project Area under current conditions is estimated to range from 2 tons per acre per year on level areas with deeper soils to 12 tons per acre on steeper slopes. Post-reclamation soil loss calculated for the Proposed Action would be around 0.7 tons per acre per year or 1,235 tons per year. Assuming mulching of at least one-third of the disturbance area and successful revegetation in 5 years, the amount of salt that would be added to regional waters is estimated at 0.005 tons per acre per year or approximately 8 tons per year, well below natural rates. Although short-term increase in erosion and subsequently salt content would be expected despite the use of effective erosion control measures, longer-term erosion and salt loading conditions are expected to be within the range of rates reported for existing conditions. Based on the analysis discussed in Section 4.4.2.1 and illustrated in Appendix 4A, it is concluded that the salinity standard adopted by Colorado River Basin Salinity Control Forum would not be exceeded by the Proposed Action. Overall, no long-term adverse impacts to surface water quality due to erosion are anticipated. The Utah water quality standards would not be exceeded as a result of project activities. Refer to Section 4.4.2.1 and Appendix 4A for a thorough discussion of the erosion potential soil loss and salt loading

analysis.

Accidental leaks or spills of fluids or wastes such as produced water from conveyance pipelines; fuels, lubricants and solvents associated with machinery; or waste drilling fluids could adversely affect surface water quality. Areas that are particularly sensitive to accidental spills or leaks include springs, seeps and perennial streams. The significance of these potential impacts depends on the amount and nature of product spilled or leaked as well as the proximity of the spill to these sensitive areas. Locations where transportation corridors would cross perennial streams are the most significant concern.

RGC would implement a leak detection program for pipelines as described in the environmental protection measure RGC3, and in accordance with Onshore Oil and Gas Order No. 7. RGC has prepared and implemented a Spill Prevention, Control and Countermeasure (SPCC) plan for handling the storage of oil and chemicals at the compressor facilities and disposal well sites. The materials are stored with secondary containment which is routinely inspected in accordance with the SPCC plan requirements. In the event of a minor accidental spill, the RGC personnel are trained to promptly contain and clean-up any released material. In addition, adherence to Onshore Oil and Gas Order No. 1 provides for safe containment and disposal of waste materials generated during drilling. Refer to Section 2.2.3.2 for a discussion of waste sources and controls.

Protection of surface water resources from accidental spills or leaks is largely reliant upon the successful implementation of the mitigation

measures discussed above. As the type of activities that will occur does not vary between alternatives, the potential for adverse impacts to occur will only vary with the size of the project. It is anticipated that these measures can be implemented irrespective of which alternative is selected; therefore, no discussion of accidental spills or leaks is carried through the alternative discussions.

Water Resources of the Ferron Sandstone

As discussed in Section 2.2.3.2, and illustrated in Appendix 2E, peak water production of the entire field of 698 existing and proposed wells is estimated to be 100,140 BWPD (12.9 ac-ft/day). Water production of each well will decrease over time. Therefore, the analysis of impacts associated with peak production overestimates the potential magnitude of effect.

Injection of production water into a target zone with poorer quality than the produced water is consistent with BLM policy and the UDOGM UIC Permit Program. However, the disposal of produced water by injecting it into a deeper, poorer quality aquifer, or by evaporating it would result in the loss of the resource or at least the degradation of the resource. Once the produced water has been injected into the disposal reservoir, it would be more expensive to retrieve than it was when it was in the shallower Ferron Sandstone. It would also be more saline than it was in the Ferron Sandstone due to mixing with the poorer quality of the disposal reservoir.

Although the loss of water from the Ferron Sandstone does not constitute a significant impact due to it currently being uneconomical as

a water source, the Proposed Action would result in the relocation and subsequent evaporation or degradation of up to 100,140 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Sandstone

The only activity that would disturb the Navajo-Nugget aquifer is the injection of water produced from the Ferron Sandstone into the Navajo-Nugget aquifer. Peak production of the Proposed Action of 698 wells is estimated to be 100,140 BWPD (12.9 ac-ft/day). Injection of production water would locally increase formation pressures and decrease salinity within the Navajo-Nugget aquifer. RGC currently disposes of production water in the American Quasar 31-1-D1 well with an approximate disposal capacity of 6,000 BWPD (0.8 ac-ft/day) based on existing injection rates. Seven new injection wells are proposed in addition to the existing permitted well. These eight wells give the operation a theoretical disposal capacity of 76,000 BWPD (9.8 ac-ft/day) assuming each new well can inject 10,000 BWPD (1.3 ac-ft/day).

Water quality in the Navajo-Nugget Aquifer is quite saline. Freethey and Cordy (1991) estimated that TDS concentrations ranged from 3,000 to more than 35,000 mg/L. TDS concentrations have been measured at 172,000 mg/L in the existing injection well and 121,000 mg/L in the recently drilled injection well, D-3 (Table 4.2-2). The injection of production water with TDS concentration less than 10,000 mg/L would thus not adversely impact the water quality of this aquifer. Similarly, injection into the Curtis Formation and Entrada Sandstone would not affect these aquifers.

The potential impacts from injection on pressure head changes in the aquifer were evaluated

using the Theis equation. The equation is used to predict changes at various distances from a given injection well location. (Refer to response to Comment I-15.2 for details on the Theis equation.) Results from simulating the injection of 10,000 BWPD per well entirely into the Navajo-Nugget aquifer for the complete 30 year project life, suggest that formation pressures in the immediate vicinity of a well may be increased by as much as 1,400 psi (equivalent to 3,225 feet of water). However, this excess pressure decreases to only 45 psi (104 feet of water) once approximately two miles away from any one injector. No noticeable pressure increase would occur at distances of about five miles

and greater. This evaluation is conservative as it assumes that this maximum flow rate would occur from day one until the end of the project. Actual water production is expected to increase incrementally for ten years, then drop off considerably, at which time individual injection rates could be decreased.

Known occurrences of fresh or potable water in the Navajo Sandstone include outcrop areas both west and east of the San Rafael Swell and in a broad area extending from the east-central edge of the Swell to the Green River. Potential water quality impacts were evaluated by reviewing the USGS publication on the quality of water in the Navajo-Nugget and Entrada-Preuss Aquifers (USGS 1991). The distance from the southern most injection well under the Proposed Action to the closest potable portion of the Navajo-Nugget aquifer is approximately 18 miles. The potentiometric surface in that area is estimated to be at least 100 feet higher than in the Project Area. In order for injected fluids to have any impact on the potable waters within the aquifer, the radius of influence would

need to extend out as far as those areas and thus the potentiometric level would have to meet or exceed the level in those areas. Therefore, there is little, if any, potential for the injection of production waters to increase the TDS concentrations of potable portions of the Navajo-Nugget aquifer.

Water Use

The Proposed Action would require water for well drilling and stimulation; construction of roads, well pads, evaporation ponds and compressor stations; and preparing magnesium chloride solution for dust suppression. Table 2.2-7 shows the estimated water requirements for each alternative. Under the Proposed Action, a total of approximately 3,830,113 barrels (494 ac-ft) would be consumed over the life of the project. As discussed in Section 1.6.2, water purchased or leased by the project would not result in further depletion or adverse impact on the Price River or Scofield Reservoir. However, the 494 ac-ft of water would shift from municipal, industrial or agricultural use to the CBM Project. Refer to Section 4.8 for a discussion of potential impacts of water consumption on Colorado River fish.

4.2.2.2 Alternative A

Surface Water Quality

Disturbances that may affect surface water quality are the same for Alternative A as they were for the Proposed Action. The factors that affect the degree to which surface water quality may be affected are also the same. The size of the disturbed area under Alternative A is larger than that of the Proposed Action. Under Alternative A, approximately 5,758 acres would be disturbed for at least a short period of time, and approximately 3,585 acres would be disturbed over the long-term. These areas represent about 3.3 percent and 2 percent of the total Project Area, respectively. There would be approximately 29 road crossings of perennial streams.

Erosion rates would be essentially the same for this alternative as for the Proposed Action as the same type of construction activities would occur. However, the amount of erosion and increased salinity would increase due to the larger area of disturbance under this alternative. Post-reclamation soils loss calculated for Alternative A would be approximately 1,540 tons per year with related salt loading estimates to surface water at 11 tons per year for the Project Area (refer to Appendix 4A, Table 4A-2). Thus, despite the increase in disturbance area and short-term sedimentation, longer-term erosion and salt loading conditions would be expected to remain within the range of rates reported for existing conditions. See Section 4.4.2.2 for a thorough discussion of erosion, soil loss and salt loading for Alternative A.

Water Resources of the Ferron Sandstone

Under Alternative A, the maximum total water production rate would be 128,720 BWPD (16.6 ac-ft/day). Although this is not considered a significant impact because the lost water resource is not considered economically useful at this time. Alternative A would result in the relocation and subsequent evaporation or degradation of up to 128,720 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Sandstone

Conservative estimates of the maximum production rate, and therefore disposal rate, for Alternative A are 128,720 BWPD (16.6 ac-ft/day). In order to dispose of this production water, the number of injection wells and evaporation ponds would be increased by 1 (to 8) compared to the Proposed Action. The total anticipated disposal capacity from injection wells and associated evaporation ponds would be 141,000 BWPD which would exceed water production by approximately 12,280 BWPD. Although the volumes of water injected into the Navajo-Nugget Aquifer would increase by approximately 10,000 BWPD, little or no potential exists for injected waters to adversely impact potable portions of the aquifer under Alternative A.

Water Use

Under Alternative A, a total of approximately 6,609,397 barrels (852 ac-ft) of water would be consumed over the life of the project, this is approximately twice the volume of water that would be required for the Proposed Action. As discussed in Section 1.6.2, water purchased or leased by the project would not result in further depletion or adverse impact on the Price River or Scofield Reservoir. However, approximately 852 ac-ft of water would shift from municipal, industrial or agricultural use to the CBM project.

4.2.2.3 Alternative B1

Surface Water Quality

The size of the disturbed area under Alternative B1 is larger than that of the Proposed Action. Under Alternative B1, a total of approximately 3,151 acres would be disturbed for at least a short period of time, and 1,818 acres would be disturbed over the long-term. These areas represent about 1.7 percent and 1 percent of the total Project Area, respectively. Under Alternative B1, there would be approximately 20 road crossings of perennial streams. Proposed roads cross the 660-foot buffer zone of springs at 9 locations.

Erosion rates would be essentially the same for this alternative as for the Proposed Action as the same type of construction activities would occur. However, the amount of erosion would decrease due to the smaller area of disturbance under this alternative. The percentage of saline soils affected by this alternative are larger than the Proposed Action although the total number of acres affected would be less. Post-reclamation soil loss calculated for Alternative B1 would be approximately 994 tons per year with related salt loadings to surface water

estimated at 7 tons per year for the Project Area (refer to Appendix 4A, Table 4A-3). As erosion salinity loadings would be essentially the

same for this alternative as the Proposed Action, remaining within the range of reported rates for existing conditions (see Section 4.4.2.3). Therefore, no long-term adverse impacts to surface water are anticipated for Alternative B1.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative B1 as they were under the Proposed Action. Under this alternative, the maximum water production rate for the project would be 90,300 BWPD (11.6 ac-ft/day). Although the loss of water from the Ferron Sandstone does not constitute a significant impact due to it currently being uneconomical as a water source, Alternative B1 would result in the relocation and subsequent evaporation or degradation of up to 90,300 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Sandstone

Conservative estimates of the maximum production rate and therefore disposal rate, for Alternative B1 are 90,300 BWPD. Under Alternative B1, the number of injection well facilities and adjacent evaporation ponds would be reduced by two to five in comparison to the Proposed Action. The total anticipated disposal capacity would be 96,000 BWPD, which would exceed 5,700 BWPD. Little or no potential exists for injected waters to adversely impact potable portions of the aquifer.

Water Use

Estimated total water requirements for Alternative B1 is about 2,797,345 barrels (361 ac-ft) to install and stimulate each well and to construct the necessary roads, pipelines, etc. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources, but would result in a change in water use.

4.2.2.4 Alternative B2

Surface Water Quality

The size of the disturbed area under Alternative B2 is larger than that of the Proposed Action. Under Alternative B2, a total of approximately 4,510 acres would be disturbed for at least a short period of time, and 2,775 acres would be disturbed over the long-term. These areas represent about 2.4 percent and 1.5 percent of the total Project Area, respectively.

Under Alternative B2, there would be approximately 26 road crossings of perennial

streams. Proposed roads cross the 660-foot buffer zone for springs at approximately 13 locations. Due to the larger area of disturbance to highly erodible and/or saline soils, the amount of erosion and salt loading would be larger for this alternative than for the Proposed Action. Post-reclamation soil loss calculated for Alternative B2 would be approximately 1,229 tons per year with related salt loadings to surface water estimated at 10 tons per year for the Project Area (refer to Appendix 4A, Table 4A-4). However, longer-term erosion and salt loading conditions are expected to remain within the range of reported rates for existing conditions (see Section 4.4.2.4). Therefore, no long-term adverse impacts to surface water resources are anticipated for Alternative B2.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative B2 as they were under

the Proposed Action. Under this alternative, the maximum water production rate for the project would be 118,890 BWPD (15.3 ac-ft/day). Although the loss of water from the Ferron Sandstone would not constitute a significant impact, approximately 118,890 BWPD would be relocated and subsequently evaporated or degraded in quality.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as for the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 7,110 BWPD. No adverse impacts are anticipated to the Navajo-Nugget Aquifer as a result of injection under Alternative B2.

Water Use

Estimated water requirements for Alternative B2 would be about 4,907,713 barrels (633 ac-ft) to install and stimulate all wells and to construct the necessary roads, pipelines etc. Impacts to existing water uses are basically the same as under the Proposed Action. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources, but would result in a change in water use.

4.2.2.5 Alternative C1

Surface Water Quality

Approximately 3,778 acres would be temporarily disturbed, and 2,170 acres would be disturbed over the long-term of the project. This represents about 2 percent and 1 percent of the total Project Area, respectively. Under Alternative C1, there would be approximately 20 road crossings of perennial streams and 10 road crossings within the 660-foot buffer of springs.

The amount of erosion and salt loading for this alternative would be essentially the same as for the Proposed Action due to the similarity in acres and type of soil disturbance. Post-reclamation soil loss calculated for Alternative C1 would be approximately 1,139 tons per year with related salt loadings to surface water estimated at 8 tons per year for the Project Area (refer to Appendix 4A, Table 4A-5). As estimated rates remained within the range reported for existing conditions, no long-term adverse impacts to surface water resources are anticipated for Alternative C1.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative C1 as were under the Proposed Action. Under this alternative, the peak water production rate would be 98,770 BWPD (12.7 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 98,770 BWPD would be relocated and subsequently evaporated or degraded.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 27,230 BWPD. Therefore, little or no potential or adverse impacts to the Navajo-Nugget aquifer exists for Alternative C1 as for the Proposed Action.

Water Use

Estimated water requirements for Alternative C1 would be approximately 3,477,913 barrels (448 ac-ft) for construction activities, and well

drilling and completion. As discussed in Section 1.6.2, this would not result in further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.6 Alternative C2

Surface Water Quality

Approximately 5,318 acres would be temporarily disturbed, and 3,306 acres would be disturbed over the long-term of the project. This represents about 3 percent and 2 percent of the total Project Area, respectively. Under Alternative C2, there would be approximately 29 road crossings of perennial streams and 17 road crossings within the 660-foot buffer of springs. Post-reclamation soil loss calculated for Alternative C2 would be approximately 1,426 tons per year with related salt loadings to surface water estimated at 11 tons per year for the Project Area (refer to Appendix 4A, Table 4A-6). Due to the larger area of disturbance to highly erodable and/or saline soils, the amount of erosion and salt loading would be larger for this alternative than the Proposed Action. Therefore, longer-term erosion and salt loading conditions are expected to remain within the range reported for existing conditions. Therefore, no long-term adverse impacts to surface water resources are anticipated for Alternative C2.

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative C2 as were under the Proposed Action. Under this alternative, the peak water production rate would be 126,670 BWPD (16.3 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 126,670 BWPD would be relocated and subsequently evaporated or degraded.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be the same as the Proposed Action; that is 126,000 BWPD. Excess disposal capacity would total 14,330 BWPD. Little or no potential or adverse impacts to the Navajo-Nugget aquifer exist for Alternative C2 as for the Proposed Action.

calculated for Alternative D would be approximately 1,100 tons per year with related salt loadings to surface water estimated at 7 tons per year for the Project Area (refer to Appendix 4A, Table 4A-7). As estimated rates remained within the range reported for existing conditions, no long-term adverse impacts to surface water resources are anticipated for Alternative D.

Water Use

Estimated water requirements for Alternative C2 would be approximately 6,080,597 barrels (784 ac-ft) for construction activities, and well drilling and completion. This would not result in any further depletion or adverse impacts to water resources but would result in a change in water use.

4.2.2.7 Alternative D

Surface Water Quality

Approximately 3,618 acres would be temporarily disturbed, and 2,079 acres would be disturbed over the long-term of the project. This represents about 2 percent and 1 percent of the total Project Area, respectively. The impacts associated with Alternative D would be similar to Alternative C1. Under Alternative D, there would be approximately 17 road crossings of perennial streams and 11 road crossings within the 660-foot buffer of springs.

The amount of erosion and salt loading for this alternative would be essentially the same as for the Proposed Action due to the similarity in acres and type of soil disturbance. Post-reclamation soil loss

Water Resources of the Ferron Sandstone

The activities that could affect the water resources of the Ferron Sandstone are the same under Alternative D as were under the Proposed Action. Under Alternative D, the maximum total water production rate would be 98,770 BWPD (12.7 ac-ft/day). This is not considered a significant impact because the lost water resource is not considered economically useful at this time. Alternative D would result in the relocation and subsequent evaporation or degradation of up to 98,770 BWPD throughout the project life.

Water Resources of the Navajo-Nugget Sandstone

The total disposal capacity would be approximately 15,000 BWPD less than the Proposed Action; that is, 111,000 BWPD. Excess disposal capacity would total 12,230 BWPD. Therefore, little or no potential exists for injected waters to adversely impact potable portions of the Navajo-Nugget Aquifer under Alternative D.

Water Use

Under Alternative D, a total of approximately 446 ac-ft of water would be consumed over the life of the project, this is approximately 48 ac-ft less than would be required for the Proposed Action. As discussed in Section 1.6.2, water purchased or leased by the project would not result in further depletion or adverse impact on the Price River or Scofield Reservoir. However, approximately 446 ac-ft of water would shift from municipal, industrial or agricultural use to the CBM project.

4.2.2.8 No Action Alternative

Surface Water Quality

Under the No Action alternative, approximately 1,907 acres would be disturbed for at least a short period of time, and 1,050 acres would be disturbed over the long-term. These areas represent about 1 percent and 0.6 percent of the total Project Area, respectively. Under the No Action alternative, there would be approximately 18 road crossings of perennial streams. Proposed roads would cross the buffer zone of springs at 5 locations. Due to the significantly smaller area of disturbance to erodable and/or saline soils, the amount of erosion and salt loading would be lower for this alternative than the Proposed Action. Post-reclamation soil loss volumes calculated for the No Action alternative range from 607 to 14,361 tons per year with related salt loadings to surface water ranging from 5 to 107 tons per year for the Project Area (see Section 4.4.1.7). As longer-term erosion and salt loading conditions are expected to remain within the range reported for existing conditions, no long-term adverse impacts to surface water resources are anticipated for the No Action alternative.

Water Resources of the Ferron Sandstone

Under the No Action alternative, the maximum production water rate for the project will be 69,940 BWPD (9.0 ac-ft/day). This is not considered a significant impact because the lost water resource is not economically useful at this time, although approximately 69,940 BWPD would be relocated and subsequently degraded.

Water Resources of the Navajo-Nugget Sandstone

Four new injection wells are proposed in Section 2.2.3.2 in addition to the existing permitted well. These five wells give the operation a disposal capacity of 81,000 BWPD. Excess disposal capacity would total 11,060 BWPD. Little or no potential for adverse impacts to the Navajo-Nugget Aquifer exist for the No Action alternative.

Water Use

Estimated water requirements for the No Action alternative is about 1,532,861 barrels (198 ac-ft) for construction activities, and well drilling and completion. This would not result in any further depletion or adverse impacts to water resources but would change water use.

4.2.3 Impacts Summary

Potential impacts to water resources under the Proposed Action, Alternatives A, B1, B2, C1, C2, and D, and the No Action alternative are summarized in Table 2.8-2.

4.2.4 Mitigation

Compliance with the environmental protection measures identified in Section 2.2.5 would provide for adequate protection of the surface and subsurface resources. No additional mitigation measures are required.

4.2.5 Unavoidable Adverse Impacts

The primary unavoidable adverse impact to water resources is the consumptive use and degradation of the water resource within the Ferron Sandstone. However, due to the poor quality and currently prohibitive depth of the water this impact is not considered significant.

4.3 AIR QUALITY

4.3.1 Introduction

Air quality in the Project Area could be impacted as a result of project construction and operations in the following ways: (1) during construction by emissions from construction equipment and suspended particulate matter (dust) from roads, drilling sites, compressor sites, and general construction activities; (2) gaseous emissions from the operation of the gas-fired compressors and glycol dehydration units at the compressor facilities; and (3) occasional flaring of gas at well sites. These impacts are discussed by alternative in this section. Methane that would be released during the completion of each well, as explained in Section 1.6.2, is not quantifiable, but is considered minimal.

The Proposed Action and alternatives include several environmental protection measures as part of the project design. Specific to air quality, RGC-1 addresses dust suppression from construction and unpaved roads. RGC-3 consists of a leak detection program to detect leaks of methane from pipelines. These measures have been taken into consideration in this impact assessment.

Air quality impacts would be considered significant if the emissions from the proposed project would lead to predicted exceedances of the ambient air quality standards. These standards have been established to protect public health and welfare with an adequate margin of safety.

Impacts to visibility due to operation of the compressor stations considered both views from inside the nearest National Park (Capital Reef) and outside the park (so-called integral vistas). An integral vista is a view from a location inside the park of landscape features located outside the park boundaries. Impacts were estimated for two assumed plume viewing backgrounds: the horizon sky and a dark terrain object. The visibility criteria are discussed in Section 4.3.2 Visibility.

4.3.2 Direct and Indirect Impacts

An Air Quality Technical Support Document was prepared to provide additional detail regarding the analysis of air quality impacts (Woodward-Clyde 1997). This document provides information regarding the dispersion model input files, the modeling results, and the interpretation of these results. The document has been reviewed by air quality specialists with the Utah Division of Air Quality (UDAQ), USEPA and National Park Service. The document provides the technical details supporting the analysis and discussion presented in Section 4.3.2 and Chapter 5. The document is available for review in BLM files at Price, Utah.

Impacts of Construction

Construction activities would result in fugitive particulate emissions from construction activities and construction vehicle traffic. Additionally, gaseous pollutant emissions such as nitrogen oxides (NO_x), carbon monoxide (CO), and sulfur dioxide (SO₂) will result from operation of construction vehicles and drilling equipment.

The description of the Proposed Action and alternatives (Chapter 2.0) includes estimates of the amount of equipment expected during construction of the proposed facilities. Because of the relatively small size of the construction fleet and duration of construction at any one given site, the emissions from the associated internal combustion engines are not expected to cause a violation of ambient air quality standards.

Based on previous studies (USDI, BLM 1996) and the number of vehicles proposed for this project, it was determined that vehicular emissions would not result in a significant environmental concern.

Earthwork during construction may contribute to emissions of particulate matter. The U.S. Environmental Protection Agency has estimated that such activity results in particulate emissions of 1.2 tons per acre per month (USEPA 1995). However, environmental protection measure RGC1 would reduce particulate emissions by 50 to 80 percent. As noted in Chapter 2.0, the amount of disturbance would be spread along the linear project facilities and at multiple sites. While particulate levels may be elevated for short periods of time at locations adjacent to the

construction sites, these activities are not expected to result in a violation of the ambient air quality standards.

Additional analysis of the fugitive dust that would be generated by the construction activities and the related vehicular traffic is provided in the support document prepared by Woodward-Clyde (1997). This analysis uses the very conservative factors found in the compilation of air pollutant emission factors (USEPA 1995). The estimate of fugitive dust resulting from the Proposed Action would be 172 tons/year during the construction period, 46 tons/year during operation, and 74 tons/year during reclamation. The alternatives would range from a low of 32 tons/year for the No Action alternative to a maximum of 109 tons per year for Alternative A. This is not considered to be significant since the emissions would be spread out over the 188,242 acres of the Project Area resulting in an average emission rate of 1.83 lbs. of particulate per acre per year during the construction period.

Although this fugitive dust would cause some localized visible dust clouds, the emissions are expected to have minimal effect on regional haze. Particulate smaller than 2.5 microns is the primary contributor to visual haze and adverse health effects. This is discussed in the material provided by USEPA in support of their recent proposal to revise the ambient particulate standard (USEPA 1996) presented by USEPA, less than 30 percent of the fugitive dust generated from unpaved roads is below 2.5 microns (USEPA 1990).

Impacts of Operation

Each gas-fired compressor station would be required to apply for an Approval Order from the UDAQ prior to starting construction. The

UDAQ has the responsibility to establish and enforce regulations designed to protect public health and welfare. Their review of the request for an Approval Order includes a review to ensure compliance of the proposed project with all of these regulations. In addition, if the project involves clearing of land, the UDAQ can require submittal of a fugitive dust control plan. Air quality impacts from the operation of the gas-fired compressor stations were predicted using the Industrial Source Complex, Short-Term model, Version 3 (ISCST3). This model is approved by the USEPA for the simulation of point and area sources in flat, intermediate and complex terrain. ISCST3 requires input variables that describe the source (its emission rates and release characteristics), the meteorological conditions that govern transport and dispersion and receptors (the location and elevation of points where concentration predictions are desired). The model has several options that affect the simulation. However, the USEPA provides guidance on which options are to be used for regulatory applications. These regulatory default options were used for the modeling in accordance with USEPA guidelines.

The specific compressor engine drivers for the Proposed Action and alternatives have not been selected at this time. In order to provide input to the modeling, similar compressor station projects were reviewed to develop a typical natural gas-fired reciprocating engine. The nitrogen oxide emissions were assumed to reflect new engines with clean burn technology. An emission rate of 1.7 grams per horsepower-hour and an engine size of 1700 horsepower were assumed. This is a very low emission rate, and represents best available control technology (BACT) (Woodward-

Clyde 1997). Engines meeting this emission rate are available on the market that would comply with current Utah permitting requirements. The number of engines at each compressor station would vary depending upon the total projected horsepower requirements. The compressor units were assumed to operate continuously throughout each day and year, at full horsepower. Data for the glycol dehydration units were taken from the compressor facility tables in Chapter 2 (Table 2.2-10 for the Proposed Action). In addition to the compressor engines and dehydrators, the Proposed Action includes the occasional flaring of gas. The number of wells to be flared is expected to be less than 10 and not all wells would be flared at the same time. Flaring at any given well may last for up to 60 days, but is more likely that only 10 days would be required to determine the adequacy of the well. The volume of gas to be flared at each well is expected to be below 150,000 cubic feet per day. The USEPA Compilation of Air Pollutant Emission Factors (USEPA 1995) states that newer, efficient flares of this size are expected to emit approximately 10.2 lbs. per day of nitrogen oxide (USEPA 1995). Even if all of the flares are operated during the same year, it is likely that the total nitrogen oxides (NO_x) emissions would not exceed one ton per year. This is equivalent to five percent of the emissions from one compressor engine and is, therefore, considered insignificant in this analysis. For the purpose of the initial screening analysis, it was assumed that the proposed new compressor facilities would be either

electrically-powered or fired on natural gas. Based on the number of compressors required and the horsepower requirements for each, it was assumed that reciprocating engines would be used for one-half of the total compression required while the remainder would be electrically powered. Use of only natural gas for compression would result in a potential exceedance of the Class II PSD air quality increment.

The use of natural gas would result in only small emissions of particulate matter and sulfur dioxide, so these compounds were not included in the analysis. Similarly, small amounts of methane may be emitted from leaks. However, concentrations of methane are expected to be well below any explosive or toxic levels and leak detection programs are included as part of the project design.

Receptor Grid

A large grid of receptors was used to ensure adequate spatial coverage as well as provide for fine enough resolution to capture the expected point of maximum impact. A nested receptor grid was used which encompassed the Project Area and the compressor stations for the proposed project and alternatives. The receptor grid was approximately centered in the Project Area and a coarse grid having 1,000 meter (0.6 mile) spacing extended 45 kilometers (28 miles) in all directions. Fine receptor grids were then imbedded in the coarse grid around the areas of maximum impact to refine the prediction of maximum concentration. The fine grid extended 4 kilometers (2.5 miles) from its center and had a spacing of 100 meters (328 feet).

In addition to the locational coordinates of each

receptor, the elevation of the receptor point was input. Receptor elevations were based on topographical maps. By entering receptor elevations, ISCST3 can simulate impact in flat, intermediate and complex terrain.

Meteorological Data

In order to simulate both short-term and annual average impacts, ISCST3 requires hourly values of temperature, wind speed, wind direction and atmospheric stability class. Monitoring stations in the general region were surveyed for the availability of such detailed data. One year of hourly data from the Utah Power and Light Clawson power plant was selected for the modeling.

The Clawson meteorological data were collected during the year 1988. These data were reviewed to assess if this year was representative of typical climatological conditions expected in the Project Area. A wind rose portraying the wind speed and direction is provided in Figure 4.3-1. Based on this review, the 1988 data represent typical transport and dispersion conditions for the Project Area.

Although the Clawson data have been used for several permitting projects in the past, some questions have been raised recently regarding the validity of the data. A review of the data reveals some missing data and some unusual periods of extended persistence of data. To respond to these concerns, it was determined the modeling should include five years of data from the Salt Lake City airport (Shawn 1997). This data set (years 1987-1991) has been used extensively for dispersion modeling analyses and the UDAQ is familiar with the data. Although the direction specific information is not correct, the relatively long data record represents the “worst case” scenario for ground-level concentrations. Figures 4.3-2

through 4.3-6 display the annual wind roses for these data. The predominant wind directions from this data set are strongly influenced by the terrain in the Salt Lake City area and are not a reasonable representation of the wind patterns in the Price area. The Salt Lake City area does experience severe inversions and periods of reduced dispersion, and, therefore, the dispersion conditions do represent a “worst case.”

Modeling Analysis

The RGC emission sources vary depending on the alternative considered. Table 4.3-1 identifies the number of potential sources at each compressor site with each alternative. This table demonstrates that Alternative A has the greatest number of sources at each site; therefore Alternative A was used to assess the combined effect of this project with other existing and proposed projects in the region. The impacts associated with the Proposed Action or any other alternative would be less than the impacts predicted for Alternative A.

Modeling Results

The estimated emissions from the compressor stations associated with Alternative A were input to the ISCST3 model as described in Table 4.3-2.

Comparison to PSD Class II Increments and Significant Impact Levels

NO₂ emissions from each compressor station were modeled using ISCST3. To provide a value that would define “significant” impact, USEPA established significant impact levels in the USEPA New Source Review Workshop Manual (USEPA 1990b).

The significant impact levels are used to determine whether a detailed air quality impact analysis needs to be performed to assess attainment with the NAAQS. Table 4.3-3 shows that the maximum impacts associated with each alternative is below the applicable Class II PSD increment. The maximum impact exceeds the significant impact level for both NO₂ and the 1-hour carbon monoxide (CO) value. CO is a product of incomplete combustion and is typically a problem pollutant in areas of dense automobile traffic. The ambient 1-hour NAAQS is 40,000 µg/m³, and the maximum ground level concentration associated with the proposed project would be only 2.3 percent of this standard. There are few major sources of CO in the area and, therefore, further analysis of CO impacts is not warranted. Figure 4.3-7 depicts the area where the NO₂ significant impact levels is exceeded when the dispersion modeling is performed using the Salt Lake City meteorological data, and Figure 4.3-8 depicts the area above the significant impact levels when the Clawson data are used. In both cases, the significant impact level does not extend beyond the project boundary.

NAAQS Analysis

To demonstrate compliance with the NAAQS,

impacts from the proposed project were combined with the predicted impacts from other existing major sources (background sources) within and around the projects’ significant impact area. “Natural” or background concentrations were considered. The background sources used for this analysis are presented in Table 4.3-4. The NO₂ modeling analysis is based on NO_x emissions from all sources; however, as stated in the USEPA’s Guideline on Air Quality Models, the presence of ozone can retard the formation of NO₂. In accordance with the Tier 2 screening procedures, a conversion factor of 75 percent is used to estimate NO₂ impacts from modeled results (USEPA 1994).

Compliance with NAAQS requires the inclusion of existing background concentrations. The background concentration is added to the predicted impacts from the proposed project. This total concentration is then compared to the NAAQS to assess attainment. Information supplied by the UDAQ indicates that reasonable maximum background NO₂ concentration in the region is 17 µg/m³. This background concentration is based on monitoring data collected in 1980 and 1981, while the major sources of NO_x in the region were in operation.

The maximum concentration (including 17 µg/m³ background) where this project would contribute above the significant impact levels, would be 25.4 µg/m³ when using the Salt Lake City meteorological data and 33.8 µg/m³ when using the Clawson data. This is well below the NAAQS of 100 µg/m³.

The conservative dispersion modeling

performed for this project indicated that the maximum ground level concentration due to the combined emissions from all of the plants in the region, compared with the background concentration would also be below the 100 $\mu\text{g}/\text{m}^3$ standard (69 using Salt Lake City data and 80.5 using Clawson data, see Table 4.3-5 and Figures 4.3-9 and 4.3-10).

Comparison to the PSD Class I Increments

Prevention of Significant Deterioration establishes increments for National Parks and Wilderness Areas referred to as Class I areas. The Class I increment is the maximum level of additional degradation that is allowed to occur within the Class I area, and is established at 2.5 $\mu\text{g}/\text{m}^3$. The remainder of the United States is considered Class II, and a larger increment level is established. As reported in Table 4.3-6, the NO_2 Class II increment, applicable to the Price area, is 25 $\mu\text{g}/\text{m}^3$.

The Project Area is over 100 km from the nearest Class I area (Capitol Reef, see Figure 4.3-7). According to the USEPA modeling guidelines, the dispersion models are not accurate at this distance. For information only, receptors were placed at each of the nearest Class I areas (Capital Reef, Canyonlands, and Arches National Parks), and at the Dinosaur National Monument. The model results indicate that the Class I increments would not be exceeded at any of these locations. The maximum predicted concentration was 0.07 $\mu\text{g}/\text{m}^3$ at Canyonlands (see Table 4.3-7). This is 2 percent of the available increment (2.5 $\mu\text{g}/\text{m}^3$).

Hazardous Air Pollutants

The incomplete combustion of natural gas can result in the emission of formaldehyde. Formaldehyde is recognized as a carcinogen.

The UDAQ has established screening criteria for several hazardous air pollutants including formaldehyde. Established risk assessment procedures use unit risk factors established by USEPA for carcinogenic compounds (USEPA 1997). Cancer risk in the range 1 per million to 1 per 10,000 is generally acceptable, while risks above 1 in 10,000 typically imply a need for remediation.

Maximum predicted ground level concentrations are adjusted for duration of exposure. The maximum exposed individual is assumed to be exposed for every hour of every day, but the project will only be operating for 30 years. Average life expectancy is 70 years. Therefore, the adjustment factor for exposure duration is 30/70 or 0.43.

The cancer risk is computed by multiplying the maximum annual predicted concentration (in $\mu\text{g}/\text{m}^3$) by the unit risk factor (in units of risk per $\mu\text{g}/\text{m}^3$), and by the overall exposure to provide an estimate of the total inhalation cancer risk.

The predicted results of the long-term risk analysis for formaldehyde are given in Table 4.3-8. These results were determined using the USEPA model -Screen 3, to predict maximum ground level concentrations beyond one quarter of a mile from the source. The compressor stations are located on state owned land and no residences would be located nearby. Currently, the closest residences are over two miles distant. The total risk is considered acceptable since it falls in the lower end of the range 1 per million to 1 per 10,000. Overall, the results on the long-term risk analysis indicate no potential for concern. In addition, given the conservative nature of the maximum exposed individual analysis, the predicted exposures may overstate what any individual would experience.

Visibility

Visibility impacts can include the impact of a visible plume from a single source or co-located group of sources (such as a compressor station), or from a general reduction in regional visibility because of the pollutant loading from multiple sources. The USEPA has established screening procedures to address the issue of visible plumes using the VISCREEN model.

VISCREEN assesses the likelihood of a visual plume being observed at a given location as well as when looking from a given location to a specific landmark.

The VISCREEN model was run to predict visibility impacts at both Capitol Reef and Arches National Parks. As a reasonable worst case assumption, the model was run for a point in each park closest to the compressor stations, and assumed all compressor units at full operation. Other scenarios would have lesser impacts.

The perceptibility of a plume is defined by two parameters: contrast and color difference, or Delta E. A contrast of 0.02 (where 1.0 would be a black/white contrast) and a Delta-E of 1 are generally assumed to be the threshold of human perceptibility. The screening criteria that VISCREEN uses are a contrast of 0.05 and a Delta-E of 2.0.

A Level 1 screening analysis is the most conservative, and is performed assuming meteorological data of stability F and a wind speed of 1.0 m/s. If compliance cannot be shown with a Level 1 analysis, a Level 2 analysis is performed.

Based on results using Alternative A, the

Proposed Action and all alternatives would meet all of the screening criteria at both Arches and Capitol Reef National Parks and Class I areas using the Level 1 screening criteria. The model results are included in the Appendix of Woodward-Clyde 1997.

While operation of the proposed compressor stations would not be expected to result in a significant impact at Capitol Reef or Arches National Parks, the NO_x emissions from all of the natural gas-fired compressor units may contribute to regional haze and a reduction in overall visual range in the Project Area. However, based on the study results of the Mt. Zirkel Wilderness Area Reasonable Attributions Study of Visibility Impairment, relatively uncontrolled emission sources such as automobiles and forest fires combined with the major coal-fired sources and smelters in the region have the greatest contribution to regional haze.

Particulate and NO₂ emissions can contribute to the formation of regional haze and impair the general visibility in a region. The Interagency Workshop on Air Quality Modeling guidance provides for a screening method to estimate regional haze impacts based on predicted 24-hour impacts. This model is typically used to predict haze contributions to vistas associated with Class I areas, but the closest Class I areas were over 100 km away, and the model is not recognized as being accurate at that distance. In addition, the concern for regional haze, as expressed during the public scoping process, was for the Price area and, therefore, the model was adapted to present information on the effect the project emissions may have on visibility in the Price area. Air quality impacts, as modeled by ISC3, are used in the regional haze calculation. The conversion of NO₂ and NO₃ emissions to a particulate takes place over time and the contribution to regional haze is

affected by several factors. These factors and the assumptions that were made are discussed in Woodward-Clyde 1997.

The modeling predicted a maximum extinction coefficient of 0.13 km^{-1} and a deciview change of 1.2. The screening level established to protect scenic vistas at Class I areas is 1.0 deciview. A deciview change of 1.2 means that on the worst case days, an observer may be able to notice a perceptible change, but on most days, the emissions from the proposed project would not cause a perceptible change. Based on the meteorological data used for the evaluation, the impact would exceed 1 deciview of change during an average of five days each year. For the Salt Lake City data set, a value of 1 deciview of change would be exceeded 1 day in 1987, 3 days in 1988, 3 days in 1989, no days in 1990, and 4 days in 1991. For the one year of Clawson data, the screening value of 1 deciview would be exceeded during 17 days.

Thus, while the Proposed Action may contribute to overall pollutant loadings and isolated visible plumes in the Project Area, the project impact to general visibility and regional haze would be expected to be minor.

Evaporation Pond

The Proposed Action also includes the use of evaporation ponds to reduce the quantity of produced water. Unlike petroleum gas projects, this project does not have any petroleum products entrained in the gas stream and, therefore, no condensate storage is required. Under normal operation, there are not expected to be any volatile organic compounds or hazardous air pollutants emitted from the wells. Water is separated from the gas stream and diverted to an injection well or evaporation pond. No volatile organic compounds emissions would result from this water. Heat is not added to the ponds, but evaporation is enhanced through spray aeration. Based on observations

of the

existing pond, some limited visible emissions may occur associated with the condensed water vapor, but this is not expected to effect regional visibility or create any traffic hazards. Dissolved salts would tend to concentrate in the evaporation pond and would eventually be entrained as “drift” from the pond. This drift may have localized impacts on the soils and vegetation, but is not expected to result in significant air quality impacts. Further analysis of the evaporation pond drift is included in Appendix 4A-2.

4.3.2.1 Proposed Action

The Proposed Action would involve development of project facilities using a well spacing of 160 acres. Short-term construction related fugitive dust would create some localized dust clouds, but would not cause an exceedance of the health based ambient air quality standards.

During peak operation, six compressor stations would be in operation with a total of 65 compressor units in operation; twenty-four compressor units would be gas fired. Modeling predicts a maximum of $14.3 \mu\text{g}/\text{m}^3$ for NO_2 (see Table 4.3-3). One-hour and eight-hour average maximum CO levels are predicted at 815 and $533 \mu\text{g}/\text{m}^3$, respectively. Emissions from the Proposed Action would contribute a maximum of 2% to the Class I increment, and would consume approximately 57% of the Class II increment. Short-term and localized impacts to visibility are expected during construction, but no long-term impacts are expected to regional haze or visibility from the Class I areas. Formaldehyde emissions would not cause an unacceptable cancer risk and drift from the evaporation pond would not result in significant

air quality impacts.

4.3.2.2 Alternative A

Alternative A would involve development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would increase, thus increasing short-term construction emissions. However, no violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would increase at some stations. Modeling predicts a maximum of 16.9 $\mu\text{g}/\text{m}^3$ for NO_2 . One-hour and eight-hour average maximum CO levels are predicted at 917 and 599 $\mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3). While impacts would be somewhat greater than under the Proposed Action, no significant impacts are predicted. Modeling predicts no significant impacts would occur related to visibility, haze, hazardous air pollutants or salt drift, similar to the Proposed Action.

4.3.2.3 Alternative B1

Alternative B1 would involve partial development of project facilities using a well spacing of 160 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

maximum CO levels are predicted at 239 and 133 $\mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3).

Impacts would be less than under the Proposed Action and no significant impacts are predicted.

4.3.2.4 Alternative B2

Alternative B2 would involve partial

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts a maximum of 3.75 $\mu\text{g}/\text{m}^3$ for NO_2 . One-hour and eight-hour average

development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts a maximum of $6.8 \mu\text{g}/\text{m}^3$ for NO_2 . One-hour and eight-hour average maximum CO levels are predicted at 349 and $228 \mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3). Impacts would be less than under the Proposed Action and no significant impacts are predicted.

4.3.2.5 Alternative C1

Alternative C1 would involve partial development of project facilities using a well spacing of 160 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations. Modeling predicts a maximum of $6 \mu\text{g}/\text{m}^3$ for NO_2 . One-hour and eight-hour average maximum CO levels are at 239 and $133 \mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3). Impacts would be less than under the Proposed Action and no significant impacts are predicted.

4.3.2.6 Alternative C2

Alternative C2 would involve partial development of project facilities using a well spacing of 80 acres. As a result of this alternative, the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No violations of the ambient air quality standards would be expected.

During operation, the number of compressor stations would be the same as for the Proposed Action; however, the number of engines would decrease at some stations.

Modeling predicts a maximum of $14.3 \mu\text{g}/\text{m}^3$ for NO_2 . One-hour and eight-hour average maximum CO levels are predicted at 769 and $484 \mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3). Impacts would be less than under the Proposed Action and no significant impacts are predicted.

4.3.2.7 Alternative D

Alternative D would be similar in impact to the Proposed Action except that one compressor station would not be constructed. This alternative would therefore result in less disturbance than would be expected to result from the Proposed Action. No violations of the ambient air quality standards would be expected.

During operation, the number of compressors at each station would be the same as the Proposed Action except that one compressor station would not be built. The dispersion modeling indicates that the maximum impact of $14.25 \mu\text{g}/\text{m}^3$ of NO_2 associated with this alternative does not change from the value

predicted for the Proposed Action (see Table 4.3-3). The amount of NO_2 , CO, and formaldehyde released into the atmosphere, and the extent of the impact associated with the project would be less than expected with the Proposed Action. Since impacts are expected to be less than the Proposed Action, no significant impacts would occur.

4.3.2.8 No Action Alternative

The No Action alternative would involve development on only state and private land. As a result the amount of surface disturbance would decrease, thus decreasing short-term construction emissions. No significant impacts would be expected.

During operation, the number of compressor engines at the stations would decrease.

Modeling predicts a maximum 7.5 $\mu\text{g}/\text{m}^3$ for NO_2 . One and eight hour maximum CO levels are predicted at 432 and 282 $\mu\text{g}/\text{m}^3$, respectively (see Table 4.3-3). Impacts would be less than under the proposed action and no significant impacts are predicted.

4.3.3 Impacts Summary

A summary comparison of impacts for each alternative is provided in Table 2.8-2. Construction activities would result in the short-term increase of particulate matter concentrations in the immediate vicinity of the work. However, no significant impacts are anticipated for any of the alternatives. During operation, the use of natural gas-fired compressors for one-half of the installed capacity would not result in emission levels that would cause significant impacts to either air quality or visibility. Under worst-case conditions, a regional haze may be discernible from Price, Utah, but plumes would not be visible from the Class I areas.

4.3.4 Mitigation

Additional measures that can be undertaken to mitigate impacts include the following:

- Follow manufacturers' specifications for the operation and maintenance of all facilities and vehicles to reduce emissions.
- Careful selection of the natural gas-fired compressor units to minimize potential emissions of NO_x and CO at the new facilities.
- Use electric-powered compressors where possible.

would lead to short-term increases of particulate matter and gaseous pollutants during

4.3.5 Unavoidable Adverse Impacts

The Proposed Action and each of the alternatives

construction. These emissions would temporarily elevate pollutant concentrations in

the immediate vicinity of the construction activities. During operation, natural gas-fired compressor engine emissions of NO_x and CO would increase ambient concentrations in the Project Area.

4.4 SOILS

4.4.1 Introduction

Impacts to soils from the construction of CBM well pads, access roads, compressor facilities, injection wells, installation of gas and water pipelines, and installation of electrical power lines include:

- I. Increased exposure of surface soil materials to accelerated erosion and loss of soils resources.
- II. Increased sediment loads of stream channels and rivers, particularly increased salinity of surface water as a result of erosion of high to very highly saline soils.
- III. Increased volumes of surface runoff resulting in new gully development.
- IV. Soil compaction and rutting from heavy equipment traffic.
- V. Reduced soil productivity as a result of decreased biological activity and reduced organic matter content of surface soils.
- VI. Loss of soil profile development due to mixing of soil horizons and break-down of soil structure.

Such adverse impacts would result from the clearing of vegetation, excavation, salvage,

stockpiling, and redistribution of soils during construction and reclamation activities. Blading or excavation to achieve desired grades could result in slope steepening of exposed soils in cut and fill areas, mixing of topsoil and subsoil materials, and the breakdown of soil aggregates into loose particles. Soil structural aggregates would also be broken down by compaction from vehicular traffic.

The absence of vegetative cover, steepening of slopes, and the breakdown of aggregates would increase the potential for channelized runoff and accelerated soil erosion. Erosion would result in the formation of more rills and gullies and increased sedimentation and salinity of surface water. The end result of these impacts would be increased difficulty in achieving successful reclamation. A combination of these impacts with sensitive soils could result in the failure of reclamation efforts.

In addition, erosion and sedimentation of highly saline soils could increase salinity of the Price River and ultimately the Colorado River (Section 4.2).

Significance Criteria

The following criteria were used to determine the significance of impacts to soils within the analysis area:

- I. Increased soil erosion that cannot be reduced by 50 percent after one year and by 75 percent after five years of soil disturbance.
- II. Excessive rill and gully development.
- III. Sedimentation and salt delivery rates in excess of natural rates of 0.005 to 0.51 tons per acre per year (USDI,

BLM 1988; Riley et al. 1982).

- IV. Location and construction of project facilities on sensitive soils (soils having one or more of the following characteristics; high erosion potential, high salinity, and unsuitable reclamation material) without the use of special construction methods.
- V. Salt drift and salt deposition downwind from the evaporation ponds that would increase soil salt content more than ten percent beyond the perimeter of the pond.
- VI. A reduction in soil productivity to a level that minimizes or prevents the disturbed area from recovering to pre-disturbance soil productivity levels.
- VII.

Implementation of the environmental protection measures discussed in Section 2.2.5 would reduce impacts to soils. Specific measures applicable to soils include:

- I. RGC-6 states that RGC would promptly reclaim all disturbed areas not needed for the life of the project.
- II. BLM 1 - BLM 23 and Appendix 2D (BLM SUPO) limit construction in sensitive areas, and provide for a general reclamation plan with erosion control measures and revegetation requirements.
- III. Site-specific measures would be developed with each agency and

private landowner prior to project development.

Measures presented or referenced in Section 2.2.5 are predominantly standard protection measures that have been recommended and implemented by industry and agencies (USDI, BLM 1992a, USDI, BLM and USDA, FS 1989, Law 1984, USDA, FS 1979).

The impact analysis for each alternative will focus on the following sensitivity units:

- I. Soils with a high erosion potential, as determined by the NRCS (USDA, SCS 1970 and 1988);
- II. Soils with salinity levels greater than 8 mmhos/cm;
- III. Soils unsuitable for use as reclamation material such as gullied lands, rock outcrops, and barren shale;
- IV. Soils with a high erosion potential in combination with highly saline soils or soils unsuitable for reclamation material.

4.4.2 Direct and Indirect Impacts

4.4.2.1 Proposed Action

Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land, with a breakdown of short- and long-term impacts.

Direct, short-term impacts under the Proposed Action would involve the disturbance of approximately 4,095 acres of soils; 2,211 acres

of federal lands, 334 acres of UDWR lands, 616 acres of state lands, and 934 acres of private lands.

Short-term impacts associated with construction activities include temporary disturbance of soils for installation of pipelines and electrical transmission lines, and construction of a road network to access all wells. Immediately following installation of the pipelines, soil would be backfilled into the trenches and regraded as necessary. Portions of the construction ROW not to be retained as part of the adjacent road would be promptly reclaimed and revegetated to reduce impacts and return these areas to productive use. Short-term impacts would affect 2,512 acres of sensitive soils.

Long-term impacts would include the disturbance of soils for development of facilities such as production wells, compressor sites, injection wells, evaporation ponds, and access roads needed for the life of the project. Reclamation and revegetation of these areas would not occur until the project is completed. Long-term impacts would affect 1,523 acres of sensitive soils (Table 4.4-1).

Sensitive soils would be avoided where possible during project construction; however, approximately 61 percent of soils disturbed under the Proposed Action fall within one or more of the sensitive soil categories described above. This includes:

- I. 1,125 acres of soils with a high erosion potential
- II. 1,236 acres of highly saline soils
- III. 151 acres of soils unsuitable for use as reclamation material

The 2,512 acres of sensitive soils that would be

impacted under the Proposed Action include 527 acres of soils with a combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material (Plate 15). None of the soils have a combination of all three of the sensitivity criteria.

Erosion

Approximately 27 percent of the total disturbance area has soils with a high potential for erosion. Trenching activities for pipeline installation would result in the removal of vegetation, mixing of soil horizons, and increased susceptibility to erosion in newly disturbed areas. Soil compaction caused by equipment traffic may decrease infiltration and water storage capacity, increase runoff, and reduce soil productivity.

Following successful reclamation of pipeline ROWs, approximately 669 acres of soils with a high potential for erosion would be impacted for the long-term. Construction of facilities would include the removal of vegetation and excavation and stockpiling of soil material. These activities would result in increased soil exposure, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to wind and water erosion. These impacts would, in turn, lead to increased runoff, soil loss, and off-site sedimentation. Additionally, rill and gully development could be expected where surface water runoff would be channelized such as in ditches along roads or around well pads, and where culverts or water bars would discharge excess water. The potential for gully development would increase with increasing slope steepness.

Soils throughout the Project Area, when

disturbed, are naturally highly erodible and complete avoidance of these sensitive areas would not be possible (Plate 12). Soil loss tolerance factors for the Project Area range from 1 to 5 tons per acre per year. That is, the maximum rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period is one ton per acre per year for the most sensitive soils.

Under a combination of natural and past and current management conditions (federal, state, and private), the soil has already eroded away in a number of areas within the Project Area leaving badlands and gullied lands. The soil map units Unsuitable Reclamation Material and Poor Quality Reclamation Material - Gullied Lands of Plate 14 define the approximate locations and extent of lands where the soil layers have been removed by mostly water erosion. The amount of ongoing soil loss in the Project Area under current conditions ranges from approximately 2 tons per acre per year on level, deeper soils to 12 tons per acre per year on steeper slopes with sparse vegetation (Cook and Sasser 1996).

Estimated soil loss, sedimentation, and salt delivery rates were calculated using the Revised Universal Soil Loss Equation (RUSLE). The methodology and calculations are in Appendix 4A-1. For comparison, soil loss was calculated for bare ground conditions representing no mitigation; mulched ground representing early reclamation; and 5-year reclamation representing successful revegetation. Without mitigation, erosion rates could be as high as 16.8 tons per acre per year, which would amount to about 29,230 tons of soil loss per year under the Proposed Action (Appendix 4A-1, Table 4A-1).

The rigorous application of erosion control measures including the use of mulch or jute netting as temporary erosion control, and construction of water bars as discussed in Section 2.2.5 would reduce the potential for soil erosion. Assuming one-third of the Project Area would be mulched (Jensen 1996), erosion rates would be reduced by 2.4 tons per acre per year. This is an 86 percent reduction compared to 16.8 tons per acre per year that would initially occur with newly disturbed, bare ground conditions prior to the installation of erosion control measures. Soil loss would be about 1,647 tons per year (Appendix 4A-1, Table 4A-1). This would reduce erosion well below existing rates of up to 12 tons per acre per year in areas already experiencing high rates of erosion.

Assuming revegetation efforts are successful within 5 years, erosion rates would be reduced by 96 percent compared to bare ground conditions. Soil loss would be 0.7 tons per acre per year or 1,235 tons per year under the Proposed Action (Appendix 4A-1, Table 4A-1).

In areas not currently undergoing accelerated erosion, the construction of facilities (roads, well pads, and structures) would increase the potential for increased surface runoff due to a precipitation event within an affected watershed. Runoff from these facilities, particularly the roads, would likely be quickly focused into channels by constructed retention and conveyance features such as water bars, roadside ditches, and culverts. It is this additional channeled runoff that would add to the area's already accelerated channel erosion (gullies and increasingly incised drainages) down stream in a number of the local

watersheds and potentially induce an expansion of gullies or stream incision to previously unaffected parts of the watersheds.

However, implementation of environmental protection measures outlined in Section 2.2.5 and measures mandated in the SUPO presented as Appendix 2D would limit the increase of channeled flows and soil loss to a brief period of construction. The construction and maintenance of berms around well and facility pads, water bars, retention and conveyance ditches, ditch gradient controls (check dams), culverts, and water energy and dispersion features would effectively control additional accelerated erosion produced by well field development. Diversion or dispersion of channelized water to less sensitive areas along with vigilant monitoring would reduce potential impacts, particularly impacts severe enough to prevent access to valleys and ranges in the Mancos shale region of the Project Area.

These measures could also potentially contribute to a reduction in existing erosion rates in high erosion areas by intercepting flows, reducing their energy, and promoting dispersal and infiltration. The effectiveness in the mitigation of existing high erosion conditions would be governed by characteristics of the watershed and the frequency and magnitude of precipitation events.

Without additional mitigation measures to prevent rill and gully development, significant localized impacts could be anticipated.

Salinity

About 30 percent of the soils disturbed under the Proposed Action are highly to very highly saline. Following successful reclamation of the pipeline ROWs, impacts would affect 766 acres of highly saline soils for the long-term. Saline soils are abundant throughout the eastern half of the Project Area and are present in scattered segments throughout the western half and, therefore, cannot be entirely avoided (Plate 13). Soils developing in Mancos Shale materials have been reported to have 1.46 to 3.8 percent salt (USDI, BLM 1988c).

As water erosion and sedimentation of saline soils is the primary mechanism by which salts would be introduced to the surface water drainage system, the absence of soil erosion controls, particularly in source areas for salts, would enhance conditions for salt introduction to surface waters. From here it would be carried by surface run-off into local creeks, streams, and rivers and ultimately into the Colorado River. The majority of sediment delivery originates from erosion and degradation of stream channels as opposed to soil erosion away from channels.

The Mancos Shale formation is also a source of selenium. Selenium generally enters the water system as a result of deep percolation, namely irrigation, when soils are “flushed” to reduce salts (Bureau of Reclamation and Soil Conservation Service 1993). The Proposed Action does not include irrigation; however, erosion and sedimentation of shallow soils overlaying Mancos Shale could potentially contribute selenium to nearby surface waters.

Assuming the current rate of soil loss is 2 to 12 tons per acre per year, and using the same methodology shown in Appendix 4A-1 and the San Rafael study (USDI, BLM 1988), natural

salt loading rates would range between 0.005 to 0.22 tons per acre per year. Another study done by Riley et al. (1982) to evaluate salt movement from the Price River Basin to the Colorado River system concluded that natural salt loading rates range from 0.08 tons per acre per year from the valley floor to 0.51 tons per acre per year in the mountains; agricultural loading rates amount to 2.81 tons per acre annually. According to the study results, 38 percent of the total salt loading is attributable to irrigated agricultural lands; 60 percent from the mountainous areas, and 2 percent from nearly level to gently sloping non-irrigated lands.

Under the Proposed Action, salt delivery rates for bare ground conditions would average 0.1 ton per acre per year. About 194 tons of salt per year would enter the Colorado River system as a result of project development and construction. Mulching at least one-third of the disturbance area would reduce salt loading by 80 percent compared to newly disturbed bare ground conditions. Salt delivery would be about 0.02 tons per acre per year, or about 27 tons per year. Assuming successful revegetation in 5 years, salt delivery would be further reduced by 95 percent to 0.005 tons per acre per year compared to bare ground conditions. This would amount to 8 tons of salt per year added to the regional water system (Appendix 4A-1, Table 4A-1). Erosion control measures would also prevent other constituents attached to soil particles, such as selenium, from entering surface waters.

The significant reduction of salt loading rates assumes the rigorous application of environmental protection measures to control erosion. Measures such as slope reduction, the

use of water bars, mulch or netting, and the avoidance of the steepest slopes all serve to reduce erosion and, therefore, sedimentation and salt delivery. It also assumes that all revegetation efforts are successful. In reality, salt delivery rates will likely be somewhere between 0.005 and 0.1 tons per acre per year. These rates fall within the natural rates presented above.

Salt Drift

Under the Proposed Action, seven evaporation ponds, in addition to one existing pond, would be constructed and operated for disposal of produced water. Depending on the alternative, the estimated amount of water that would be produced ranges from 9.0 to 16.6 ac-ft/day, with approximately 6,500-9,000 mg/L TDS (refer to Chapter 2.0 for further details). Natural evaporation of the produced water would be enhanced by spraying the water about six feet high through a network of nozzles floating on the surface of the evaporation pond. Salt in water droplets or dry salt particles could be blown beyond the perimeter of the pond depending on wind speed and atmospheric conditions, as well as the size of the salt particles, size of the water droplets, salt concentrations of water in the pond, and other factors (see Appendix 4A-2). Salt drift downwind from the evaporation ponds and deposition to local soils could increase soil salinity levels. Should salt drift result in a significant increase in soil salinity around the ponds, vegetation could be affected, and erosion of saline soils could increase salt delivery to local surface waters.

A Gaussian air dispersion model was performed

to predict deposition of salt particles. Refer to Appendix 4A-2 for the methodology and calculations used to estimate salt drift. This model calculated the transport properties of salt using the operations and conditions currently found at the existing pilot test pond. Two types of drift were modeled; salt as a particle and salt within water droplets. The individual contributions from each of the two types of drift were then summed to find the total accumulation anticipated at the perimeter of the pond. Modeling results estimate that the maximum amount of salt deposited at the edge of the pond over the 20 year life of the project would be 159 lbs/acre or 0.08 tons/acre. The amount of salt deposition would decrease at increasing distances from the edge of the pond, and would be less in other wind directions. The vast majority of the salt deposition would be due to the transport of free salt particles released during the enhanced evaporation process rather than salt particles in water droplets.

Potential impacts would vary depending on the physical and chemical characteristics of soils in the vicinity of the ponds. The location of each pond was plotted on SCS detailed soils maps for Carbon and Emery County. The location of the existing and proposed ponds, and the soil map unit where the ponds would be located are shown on Table 4.4-2.

Most of the ponds (Pond Nos. 1, 3, 4, 6, 7, 10, 11, and 13) would be located on deep to very deep, well-drained, sandy loams, with low to moderate salinity levels. It is expected that salt levels would increase by approximately three to nine percent in the top one inch of soil, if all of the salt accumulated in this layer during the operational life of the evaporation pond. However, salts added to these soils would be easily leached because of their drainage characteristics. Thus, the addition of salt from

drift would be attenuated as the salt leached down through the soil, and deposited salts would be unlikely to erode to surface water systems in the Project Area. The amounts of salt added would not be likely to adversely affect existing vegetation, especially when leached into the soil column. The Travessilla soils (Pond Nos. 5 and 9), while shallow (about 17 inches deep), overlay sandstone and are also unlikely to be impacted by salt drift because they are naturally low in salt and are deep enough that minor additions of salt would be attenuated.

Pond Nos. 2, 8, and 12 are or would be located on shallow soils over beds of weathered shale or gypsum (a natural source of salts). These soils are loams and silty clay loams that are highly saline, strongly calcareous (containing calcium carbonate), and currently undergoing active erosion. Because these are already highly saline soils, the relative percent increase of salts would be only about one percent in the top inch of soil. Salts deposited on these soils may erode and contribute to existing salt delivery to intermittent drainages and ultimately to surface waters. Because of the very small increase in soil salinity, and the small area of effect compared to natural sources of salt, impacts would be minor and would be unlikely to be noticeable or measurable in the field.

An increase in soil salinity in surface soils by one to nine percent is a conservative estimate representing worst case conditions. Based on these numbers, salt drift from the evaporation ponds is not expected to result in significant impacts to soils, vegetation, or surface waters for any of the alternatives.

Soils Unsuitable for Use as Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of soils that would be impacted by development of the Proposed Action. Following successful reclamation of the pipeline ROWs, 88 acres of soils unsuitable for reclamation material would be affected for the long-term.

These soils occur throughout the Project Area, particularly the riverwash material along the Price River, and badlands and rock outcrops located in the southeastern part of the Project Area (Plate 14). Project construction activities would not have significant impacts on these soil series; however, these areas can not provide coversoil material for reclamation activities. Reclamation material for these areas would have to be obtained from suitable material salvaged and stockpiled elsewhere in the Project Area.

While disturbance of these areas would not increase erosion, application of erosion control measures between the rocky sites and adjacent soils would control runoff, and reduce erosion and subsequent gulying of adjacent soils.

Overlap of Soil Constraints

Thirteen percent of the soils that would be disturbed with implementation of the Proposed Action are both highly susceptible to erosion and highly saline. These very sensitive soils are distributed throughout the eastern half of the Project Area but generally do not occur in the vicinity of the Price River or Gordon Creek (Plate 15). Following successful reclamation of the pipeline ROWs, impacts would affect 328 acres for the long-term.

Approximately three percent of the soils that would be disturbed with implementation of the Proposed Action have a high erosion potential and are also unsuitable for use as reclamation material. All of this category of sensitive soils is located in Emery County, northeast of Elmo (Plate 15). Moderate to severe erosion of shaly colluvial land on mesas and benches, and stony alluvial land on the floodplains can increase erosion of adjacent, highly erodible soils. Impacts are not expected to be significant with the implementation of the erosion control measures discussed previously.

4.4.2.2 Alternative A

This alternative would affect about 41 percent more area than the Proposed Action, and impacts to sensitive soils would increase by 48 percent. Construction activities would initially impact 5,758 acres of soils; 3,585 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 1,590 acres of soils with a high erosion potential
- II. 1,929 acres of highly saline soils

III. 207 acres of soils unsuitable for reclamation material

Alternative A would initially impact 819 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 28 percent of soils disturbed under Alternative A have a potential for high erosion. Successful, reclamation of temporarily disturbed areas associated with the pipeline ROWs would reduce impacts to 998 acres of highly erodible soils for the long-term.

As previously discussed, soils with a high erosion potential occur throughout the Project Area and, therefore, would be difficult to avoid. Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be increased due to the larger area of disturbance under this alternative. Soil loss could range from 36,441 to 1,540 tons per year (Appendix 4A-1, Table 4A-2).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 34 percent of soils disturbed under Alternative A are highly to very highly saline. Following construction activities, successful reclamation of the pipeline ROWs would reduce impacts to 1,247 acres of saline soils for the long-term.

As previously discussed, saline soils occur throughout the Project Area, particularly in the eastern portion. Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would increase due to the larger area of disturbance under this alternative. Potential salt loading estimates range from 255 to 11 tons per year (Appendix 4A-1, Table 4A-2).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative A. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative A would initially affect about 14 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 529 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for use as

reclamation material. About 102 acres would be affected long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.3 Alternative B1

This alternative would affect about 7 percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 3,151 acres of soils; 1,818 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 980 acres of soils with a high erosion potential
- II. 1,202 acres of highly saline soils
- III. 142 acres of soils unsuitable for reclamation material

Alternative B1 would impact 500 acres of soils with a combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 31 percent of soils disturbed under Alternative B1 have a potential for high erosion. Successful reclamation of temporary disturbance associated with the pipeline ROWs would reduce long-term impacts to 589 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would

be less due to the smaller area of disturbance under this alternative. The amount of soil loss ranges from 22,346 to 944 tons per year (Appendix 4A-1, Table 4A-3).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 38 percent of soils disturbed under Alternative B1 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 747 acres of saline soils.

Since the reduction of acres disturbed under this alternative occurs in the western portion of the Project Area, the percentage of saline soils affected is larger than under the Proposed Action although the total number of acres affected would be slightly less. Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would be less due to the smaller area of disturbance under this alternative. Potential salt loading estimates range from 167 to 7 tons per year (Appendix 4A-1, Table 4A-3).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about five percent of the soils impacted by Alternative B1. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative B1 would initially affect 16 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 311 acres.

Implementation of this alternative would also affect approximately 4 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 71 acres would be affected long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.4 Alternative B2

This alternative would affect about 39 percent more acres of sensitive soils than the Proposed Action. Construction activities would impact 4,510 acres of soils; 2,775 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 1,399 acres of soils with a high erosion potential
- II. 1,887 acres of highly saline soils
- III. 198 acres of soils unsuitable for reclamation material

Alternative B2 would impact 786 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 31 percent of soils disturbed under Alternative B2 have a high potential for erosion. Successful reclamation associated with the pipeline ROWs would reduce long-term impacts to 882 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be greater due to the larger area of disturbance of highly erodible soils under this

alternative. The amount of soil loss ranges from 29,084 to 1,229 tons per year (Appendix 4A-1, Table 4A-4).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 42 percent of soils disturbed under Alternative B2 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 1,228 acres of saline soils.

Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would increase due to the larger area of

disturbance under this alternative. Potential salt loading estimates range from 229 to 10 tons per year (Appendix 4A-1, Table 4A-4).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative B2. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative B2 would initially affect 17 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 511 acres.

Implementation of this alternative would also affect approximately 4 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 102 acres would be affected long-term.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

4.4.2.5 Alternative C1

This alternative would affect about one percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 3,778 acres of soils; 2,170 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 1,091 acres of soils with a high erosion potential
- II. 1,236 acres of highly saline soils
- III. 150 acres of soils unsuitable for reclamation material

Alternative C1 would impact 527 acres of soils with a combination of high erosion potential and high salinity characteristics, and 116 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 29 percent of soils disturbed under Alternative C1 have a high potential for erosion. Successful reclamation of the pipeline ROWs would reduce long-term impacts to 653 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. The amount of soil loss would be slightly less due to the smaller area of disturbance under this alternative. The amount of soil loss ranges from 26,956 to 1,139 tons per year (Appendix 4A-1, Table 4A-5).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 33 percent of the soils disturbed under Alternative C1 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 767 acres of saline soils.

Salinity levels and the potential for increased salinity of the Price River and ultimately the Colorado River would be essentially the same for this alternative as for the Proposed Action. Potential salt loading estimates range from 189 to 8 tons per year (Appendix 4A-1, Table 4A-5).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative C1. Long-term impacts would affect 88 acres. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative C1 would initially affect 14 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 328 acres.

Implementation of this alternative would also

affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 70 acres would be affected for the long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.6 Alternative C2

This alternative would affect about 47 percent more acres of sensitive soils than the Proposed Action. Construction activities would impact 5,318 acres of soils; 3,306 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 1,561 acres of soils with a high erosion potential
- II. 1,929 acres of highly saline soils
- III. 206 acres of soils unsuitable for reclamation material

Alternative C2 would impact 820 acres of soils with a combination of high erosion potential and high salinity characteristics, and 160 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes

impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 29 percent of soils disturbed under Alternative C2 have a high potential for erosion. Successful reclamation of the pipeline ROWs would reduce long-term impacts to 986 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be greater due to the larger area of disturbance under this alternative. The estimated amount of soil loss ranges from 33,759 to 1,426 tons per year (Appendix 4A-1, Table 4A-6).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 36 percent of the soils disturbed under Alternative C2 are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 1,248 acres of saline soils.

Salinity levels would be essentially the same for this alternative as for the Proposed Action; however, the potential for increased salinity of the Price River and ultimately the Colorado River would be greater due to the larger area of disturbance under this alternative. Potential salt loading estimates range from 250 to 11 tons per year (Appendix 4A-1, Table 4A-6).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of soils impacted by Alternative C2. Long-term impacts would affect 128 acres. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative C2 would initially affect 15 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 529 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 102 acres would be affected for the long-term.

The impacts and mitigation measures discussed under the Proposed Action would also apply to this alternative.

4.4.2.7 Alternative D

This alternative would affect about one percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 3,712 acres of soils; 2,160 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 1,106 acres of soils with a high erosion potential
- II. 1,236 acres of highly saline soils
- III. 151 acres of soils unsuitable for reclamation material

Alternative D would impact 527 acres of soils with a combination of high erosion potential and high salinity characteristics, and 117 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 30 percent of soils disturbed under Alternative D have a high potential for erosion. Successful reclamation of the pipeline ROWs would reduce long-term impacts to 665 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. The amount of soil loss would be slightly less due to the smaller area of disturbance under this alternative. The amount of soil loss ranges from 26,029 to 1,100 tons per year (Appendix 4A-1, Table 4A-7).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 33 percent of the soils disturbed under Alternative D are highly to very highly saline. Following construction activities, successful reclamation of pipeline ROWs would reduce long-term impacts to 765 acres of saline soils.

Salinity levels and the potential for increased salinity of the Price River and ultimately the Colorado River would be slightly less than for this alternative than for the Proposed Action. Potential salt loading estimates range from 172 to 7 tons per year (Appendix 4A-1, Table 41-7).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by Alternative D. Long-term impacts would affect 89 acres. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of Alternative D would initially affect 14 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 327 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 71 acres would be affected for the long-term.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

4.4.2.8 No Action Alternative

This alternative would affect about 47 percent fewer acres of sensitive soils than the Proposed Action. Construction activities would impact 1,907 acres of soils; 1,050 acres would be affected for the life of the project. Short-term impacts to sensitive soils include:

- I. 528 acres of soils with a high erosion potential
- II. 724 acres of highly saline soils
- III. 76 acres of soils unsuitable for reclamation material

The No Action alternative would impact 221 acres of soils with a combination of high erosion potential and high salinity characteristics, and 50 acres of soils with a combination of high erosion potential and soils unsuitable for reclamation material. Table 4.4-1 summarizes acres of impacts to sensitive soils on federal, UDWR, state, and private land.

Erosion

About 28 percent of soils disturbed under the No Action alternative have a potential for high erosion. Successful reclamation of associated with the pipeline ROWs would reduce long-term impacts to 303 acres of highly erodible soils.

Erosion rates would be essentially the same for this alternative as for the Proposed Action since the same types of construction activities would occur. However, the amount of soil loss would be less due to the smaller area of disturbance under this alternative. The estimated amount of soil loss ranges from 14,361 to 607 tons per year (Appendix 4A-1, Table 4A-8).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Salinity

About 38 percent of soils disturbed under the No Action alternative are highly to very highly saline. Successful reclamation following construction activities would reduce long-term impacts to 456 acres of saline soils.

Since the reduction of acres disturbed under this alternative occurs in the western portion of the

Project Area, the percentage of saline soils affected is larger than under the Proposed Action although the total acres affected would be significantly fewer. Salinity levels would be essentially the same for this alternative as for the Proposed Action, however, the potential for increased salinity of the Price River and ultimately the Colorado River would be less due to the smaller area of disturbance under this alternative. Potential salt loading estimates range from 107 to 5 tons per year (Appendix 4A-1, Table 4A-8).

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Unsuitable Reclamation Material

Soils considered unsuitable for reclamation material comprise about four percent of the soils impacted by the No Action alternative. The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

Overlap of Soil Constraints

Implementation of the No Action alternative would initially affect 12 percent of soils in the disturbance area that are both highly susceptible to erosion and highly saline. Following successful reclamation of the pipeline ROWs, long-term impacts would be reduced to 165 acres.

Implementation of this alternative would also affect approximately 3 percent of soils in the disturbance area that have a high erosion potential and are unsuitable for reclamation material. About 29 acres would be affected

long-term.

The same impacts and mitigation measures discussed under the Proposed Action would apply to this alternative.

4.4.3 Impacts Summary

A summary comparison of the impacts of the alternatives is presented in Table 2.8-2. Implementation of the Proposed Action or any one of the alternatives would affect between 1,907 acres and 5,758 acres. Successful reclamation efforts along the pipeline ROWs would reduce long-term impacts to 3,585 acres to 1,050 acres. Long-term impacts resulting from construction and operation of drill pads and access roads, site facilities, and evaporation ponds could include removal of vegetation, exposure of the soil, mixing of soil horizons, soil compaction, loss of topsoil productivity, and increased susceptibility of the soil to erosion. These impacts could increase runoff, erosion, and off-site sedimentation, particularly of saline soils. Natural erosion of soils in the Project Area can be as much as 12 tons per acre per year and implementation of any of the alternatives could be expected to increase erosion, particularly in the soils with a naturally high potential for erosion. Estimated erosion rates range from 0.7 to 16.8 tons per acre per year. Soil loss estimates range from 607 to 36,440 tons per year (Appendix 4A).

Along with increased erosion, sedimentation of saline soils and increased salt loading of the Colorado River system could be expected. Potential salt loading estimates range from 5 to 255 tons per year (Appendix 4A) depending on the amount of disturbance and the type of reclamation measures implemented.

Although sensitive soils occur throughout the Project Area and are unavoidable, impacts

could be kept to non-significant levels with the application of the environmental protection measures described in Section 2.2.5.

4.4.4 Mitigation

As with any adverse impact, avoidance of the impact should be considered first. Avoidance of particularly sensitive soil areas should be given attention in both the project planning and project construction phases. Particular sensitive soil areas that should be avoided include those with a high erosion potential, high salinity and badlands, rock outcrops, barren shale and riverwash material. As indicated previously, 49 percent of the analysis area comprises sensitive soils, 17 percent of which includes areas with combinations of the sensitive soils mentioned above. Sensitive soils should be avoided where feasible; however, given their wide distribution and area covered, complete avoidance would likely not be feasible. Therefore, special measures or best management practices would need to be implemented to minimize the chance of significant impacts resulting from construction in sensitive soils.

Recommended measures that should be considered in minimizing adverse impacts include careful construction and performance monitoring to ensure effective application of control measures. These measures primarily address the issues of surface runoff, erosion, and sedimentation control as well as effective revegetation of disturbed areas.

To prevent excessive rill and gully development where surface water runoff is channelized, ditches, culverts, and waterbars should be designed to intercept overland flow and disperse it to stable locations. Sediment retention devices such as silt fences, bales of straw, or recontouring disturbed areas to reduce runoff velocities and contain saline

soils may be needed to prevent soils from entering downstream drainages. Additionally, minimizing soil disturbance within a 500-foot buffer zone of perennial surface water would also reduce potential impacts from erosion of saline soils.

The soil loss calculations in Appendix 4A-1 highlight the significance of applying erosion control measures which can effectively reduce erosion up to 85 percent compared to bare ground conditions prior to implementation of erosion control mitigation. Successful vegetation could reduce erosion rates up to 96 percent compared to bare ground conditions. Similarly, sedimentation and salt loading could also be significantly reduced with effective application of the environmental protection measures.

Incomplete application of these measures, where needed, could result in failed erosion control and revegetation efforts. Such measures, if applied, would reduce impacts to soils. Additionally, through the construction of erosion control structures in areas of naturally accelerated erosion, current erosion rates could be reduced with implementation of any of the project alternatives.

4.4.5 Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to soils would occur due to development of the Proposed Action or other alternatives with the implementation of mitigation stipulations identified in Section 2 and Appendix 1B. Although successful surface runoff, erosion, and sedimentation control is feasible on most of the soils in the Project Area, there is a residual chance of ineffective application of control measures. Significant unavoidable adverse impacts are unlikely given the range of mitigation measures available to the operators. However, failure to apply best management practices during the planning, construction, or performance monitoring phases could result in significant localized impacts.

4.5 VEGETATION

4.5.1 Introduction

Direct disturbance or removal of vegetation would occur from construction of well pads, transportation corridors, and other facilities, and can be quantified by acres affected. The disturbance may be short-term, for example from pipeline construction; or long-term, where previously vegetated areas would be occupied by wells, roads or other semi-permanent facilities. Where disturbance is short-term, the ecological effects may be either short or long-term, depending on the plant community affected and the success of revegetation. Areas of short-term impacts would be reclaimed shortly after disturbance, while areas occupied by semi-permanent facilities would be reclaimed at the end of the economic lifespan of the facility. The success or failure of revegetation may have adverse effects on other resources, including wildlife, visual resources, recreation and livestock grazing.

The relative significance of impacts to the different vegetation types in the Proposed Action depends on their social and ecological sensitivity and importance:

Riparian and wetland areas are considered sensitive because of their importance for wildlife habitat and biotic diversity, their role in water quality protection, and specific laws or federal agency policy protecting them. Wetlands are discussed in more detail in Section 4.6. In addition, wooded riparian habitats require a longer time to regain current conditions after

disturbance and revegetation than shrub and herbaceous communities.

Pinyon-juniper woodland also has a much longer recovery period than other communities, up to 150 years to regain mature woodland. Impacts to pinyon-juniper woodland would affect visual resources (Section 4.12) and wildlife habitat. Pinyon-juniper woodlands also provide thermal cover to wintering mule deer and elk.

Impacts to sagebrush-grass, salt desert and mountain shrub communities are generally considered less sensitive because of their shorter recovery time and their relative abundance. However, impacts to these communities in big game critical winter range may have short- to mid-term consequences, depending on the success of revegetation, and would affect carrying capacity of the critical habitat during the period required to re-establish vegetation.

Indirect impacts to vegetation may occur from introduction or spread of noxious weeds, from increases in fire, accidental spills of fuels, lubricants, or other materials, and fugitive dust.

A number of environmental protection measures are required by law or by agency regulation, or committed to by RGC (Section 2.2.5). Measures specifically providing for protection or reclamation of vegetation include RGC 7 (reclamation), RGC 8 and 9 (noxious weeds), BLM 1 (siting, including avoidance of wetlands and riparian), BLM 2-3 (erosion control) BLM 4-5 (avoidance of streams and springs), BLM 6-7 (minimization of disturbance), BLM 8-23 (reclamation and erosion control), BLM 24 (control of wildfire), and BLM 36 (minimization of impacts in wetlands and riparian areas).

Reclamation would be required for all project facilities under either BLM or UDOGM regulations, and bonding is required by both the

BLM and UDOGM. Enhancement of existing vegetation would be required to mitigate impacts to big game critical winter habitat, under environmental protection measure BLM 38.

The impacts associated with each of the alternatives are discussed below, including effects on specific vegetation types, noxious weeds, and revegetation. Other potential impacts, such as accidental spills of fuels, lubricants, or other materials, and fugitive dust, would be likely to have only minor and local effects on vegetation. Increases in range fires could potentially occur under all alternatives because of increased human presence in the Project Area.

4.5.2 Direct and Indirect Impacts

4.5.2.1 Proposed Action

Vegetation Types

The acres of directly-impacted vegetation are presented in Table 4.5-1. A total of 4,095 acres of vegetation would be affected by construction, and 2,353 acres would be occupied by project facilities during operation. The largest impacts would occur in the sagebrush/grass vegetation type, and more than half of the total acres affected would be in this type. About one-fourth of the impacts would occur in salt desert, and about one-eighth in pinyon-juniper woodland. Montane and subalpine communities would not be directly affected, and only minor amounts of mountain shrub would be affected. Overall, construction would affect about 2.2 percent of the vegetation in the Project Area, and operations facilities would occupy 1.2 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impact in any vegetation type would be 2.9 percent (sagebrush-grass).

About 73 acres of riparian/wetland vegetation would be affected during construction, and 42 acres would be occupied by facilities during operation, based on the proposed locations of facilities. However, riparian areas would be avoided during final selection, design and permitting of facilities, and actual impacts are likely to be substantially less. Since riparian areas are mostly small and scattered, wells and some sections of transportation corridors would easily be relocated short distances to avoid direct disturbance. Where disturbance to riparian areas would not be avoided, the

magnitude of impacts would be reduced by avoiding wooded and higher quality shrub riparian areas, and routing transportation corridors through more disturbed or lower quality habitat. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields.

Pinyon-juniper woodlands would have about 470 acres of construction impacts (1.4 percent of this type in the Project Area), and 275 acres of operational impacts (0.8 percent). The approximately 200 acres difference includes transportation corridors which would be subject to short-term disturbance. Because of the long time required to re-establish mature pinyon-juniper woodlands, impacts to all of these areas would be long-term, even if young pinyon and juniper trees re-establish quickly in revegetated areas. Impacts to pinyon-juniper woodlands would occur in small blocks at well sites and in relatively narrow transportation corridors scattered through the Project Area and there would not be any areas with large-scale removal of woodlands.

Noxious Weeds

Noxious weeds may invade areas disturbed by construction, and may spread along the cleared transportation corridors and along roads. Soil disturbance may also allow weed seed already present to germinate and grow, freed from competition. Species of greatest concern are probably Russian knapweed, other knapweed species, musk thistle and Scotch thistle in upland areas; and leafy spurge, Canada thistle, quackgrass, field bindweed, and white top in agricultural and riparian areas. As described in Section 3.5, there have been minor problems on RGC facilities to date, involving small numbers of musk thistle, but there have been no formal complaints or actions involving RGC facilities. Musk thistle would likely be a bigger problem on developments in the western portion of the Project Area than where existing RGC facilities are located (Wise 1996). In addition, the much larger area of construction disturbance in the Proposed Action could result in increased noxious weed problems. Under some circumstances noxious weeds could be numerous enough to interfere with revegetation, or could invade natural vegetation outside the disturbed area. The spread of noxious weeds would be considered significant if it resulted in uncontrolled new infestations of noxious weeds on areas disturbed by the project or on adjacent areas.

Several project components would help to control the spread of noxious weeds, including revegetation, use of weed-free seed, and use of weed control measures as necessary. Weed control might include mechanical methods such as harrowing or disking, or chemical controls. If chemical control were used, prior approval would be obtained from the landowner, and only chemicals approved for the specific application would be used.

Under the Utah Noxious Weed Act, landowners are required to control noxious weeds on lands under their control. If this is not done, the county weed boards have the authority to perform control measures at the expense of RGC, after notification and hearing. Given the legal requirement for weed control, a regulatory mechanism that ensures compliance, and RGC commitment to monitor and control noxious weeds, significant impacts from the spread of noxious weeds would be unlikely.

Revegetation

The proposed project includes reclamation of disturbed areas, either immediately after construction (pipelines) or at the end of the useable life of the facility. Disturbed lands would be revegetated to BLM or landowners specifications, with the goal of replacing removed vegetation with new vegetation of equal or greater forage and watershed values.

Specific seed mixes have been developed by the BLM for each major vegetation type in the Price CBM Project Area (Appendix 2F). Grass, forb, and shrub species were selected which would provide the greatest chance for successful long-term establishment of a stable and diverse community, and based on guidelines in Interagency Forage and Conservation Planting Guide for Utah (Utah Interagency Plant Materials Committee, 1989). Use of native species in seed mixtures was dictated based on past success. Species were selected based on erosion control, forage production, elevation, soils, vegetation communities and average precipitation zones. Appendix 2F presents mixes for salt desert, sagebrush-grass, pinyon-juniper, mountain brush, riparian, and

disturbed areas. These or similar seed mixtures would also be used on UDWR, Utah School and Institutional Trust Lands, and private lands, depending on landowner requirements. Fall seeding would likely have the greatest success (because of winter moisture) and would be used where feasible. Seedlings and/or planting would be repeated as necessary until satisfactory revegetation is accomplished as determined by BLM or other landowners. Salvage and replacement of topsoil would aid in revegetation by preserving and replacing existing seed banks and by returning to the soil organic matter needed for seed establishment. Temporary erosion controls would be used as needed until vegetation became established. Appropriate seedbed preparation would be needed, possibly including ripping, pitting, or use of mulch to increase the percentage of soil organic material.

Revegetation would result in impacts if it were unsuccessful. Removal of vegetation would be considered significant, if after reclamation, disturbed areas did not have adequate cover, diversity and composition to support pre-existing land uses, including use as wildlife habitat. The time span for achievement of successful reclamation would be at least five years in upland habitats, and two years in agricultural, riparian and wetland habitats.

As described in the affected environment, environmental conditions in the Project Area may make revegetation difficult. They include low and erratic precipitation especially in the salt desert areas, high erosion potential and/or salinity in some areas, and likely use of revegetation plants by grazing animals. Revegetation efforts on RGC facilities to date have reportedly been mostly successful in

1993 to 1995, after poor success in 1992. Revegetation success would be monitored and areas re-treated as necessary until success is achieved.

Revegetation in mule deer winter range represents a special case. Because mule deer are browsers, re-establishment of pre-existing habitat values may not occur within five years, because shrubs are slower to establish than grasses and forbs.

4.5.2.2 Alternative A

This alternative would affect about 40 percent more area than the Proposed Action, a total of 5,758 acres of vegetation during construction, and 3,585 acres during operation. The distribution of impacts by vegetation type would be similar to the Proposed Action - about half of the total acres affected would be sagebrush-grass, about 27 percent would be salt desert, and about 11 percent would be pinyon-juniper. Montane and subalpine communities would not be directly affected, and only minor amounts of mountain shrub would be affected. Overall, construction would affect about 3.1 percent of the vegetation in the Project Area, and operations facilities would occupy 1.9 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impacts in any vegetation type would be 3.8 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be about 50 percent larger, 100 acres during construction and 63 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting

of facilities. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields, and not subject to BLM authority.

The acreage of impacts to pinyon-juniper woodlands would be about 40 percent larger under this alternative than the Proposed Action, 658 acres during construction impacts (2 percent of this type in the Project Area), and 412 acres during operational impacts (1.2 percent). The types of impacts would be the same as for the Proposed Action.

The types of noxious weeds impacts would be similar to those identified for the Proposed Action. More lands would be disturbed under this alternative, and more weed control would be required. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.3 Alternative B1

This alternative would affect about 25 percent less lands than the Proposed Action, a total of 3,151 acres of vegetation during construction, and 1,818 acres during operation. Impacts would primarily occur in the sagebrush-grass and salt desert vegetation types. Overall, construction would affect about 1.7 percent of the vegetation in the Project Area, and operations facilities would occupy 1.0 percent of the area. The Project Area would remain predominantly in natural vegetation, and the maximum proportion of impacts to any vegetation type would be 2.1 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be the same as for the Proposed Action, 73 acres during construction and 42 acres during operation. As with the Proposed Action, actual impacts would

likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the

potential riparian/wetland impact area is on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be only about half the area affected by the Proposed Action, 235 acres during construction and 126 acres during operation (0.7 and 0.4 percent, respectively of the area of this type in the Project Area). The types of impacts would be the same as for the Proposed Action.

The types of noxious weeds impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.4 Alternative B2

This alternative would affect slightly more area than the Proposed Action, a total of 4,510 acres of vegetation during construction, and 2,775 acres during operation. Impacts would primarily occur in the sagebrush-grass and salt desert vegetation types. Overall, construction would affect about 2.4 percent of the vegetation in the Project Area, and operations facilities would occupy 1.5 percent of the area. The Project Area would remain predominantly in natural vegetation, and the largest proportion of impacts to any vegetation type would be 3.0 percent (salt desert), and 2.8 percent (sagebrush-grass).

The acreage of potential impacts to riparian and

wetland vegetation would be 40 to 50 percent larger than the Proposed Action, 100 acres during construction and 63 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area would be on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be about 30 percent less than the Proposed Action, 325 acres during construction (1.0 percent of this type in the Proposed Action), and 188 acres during operation (0.6 percent). The types of impacts would be the same as for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action.

4.5.2.5 Alternative C1

Alternative C1 would affect about 8 percent less vegetated lands than the Proposed Action: about 3,778 acres from construction, and 2,170 acres during operation. As with previously discussed alternatives, impacts would occur mainly in the sagebrush-grass and salt desert vegetation types. Construction activities would affect about 2.0 percent of the vegetation in the Project Area, and operational facilities would occupy 1.2 percent of the vegetation. The Project Area would remain primarily in natural vegetation, and the largest impacts to any vegetation type would be 2.6 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be the same as the Proposed Action, 73 acres during construction and 42 acres during operation. Actual impacts would likely be substantially less because these areas would be avoided during final location and permitting of the facilities. Most of the potential impact area is on private land adjacent to agricultural areas.

The area of impacts to pinyon-juniper woodlands would be about 12 percent less than with the Proposed Action, 408 acres during construction, and 236 acres during operation. These represent 1.2 and 0.7 percent, respectively, of the mapped areas of pinyon-juniper woodland in the Project Area. The types of impacts would be the same as described for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and mitigations would also be the same as for the Proposed Action. A slightly smaller area would require revegetation after construction of pipelines and at the closure of the project.

4.5.2.6 Alternative C2

Alternative C2 would affect about 40 percent more vegetated lands than the Proposed Action: about 5,318 acres from construction, and 3,306 acres during operation. As with previously discussed alternatives, impacts would occur mainly in the sagebrush-grass and salt desert vegetation types. Construction activities would affect about 2.8 percent of the vegetation in the Project Area, and operational facilities would occupy 1.7 percent of the vegetation. The Project Area would remain primarily in natural vegetation, and the largest impacts to any vegetation type would be 3.4 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be larger than the Proposed Action and the same as Alternative A, 100 acres during construction and 62 acres during operation. Actual impacts would likely be substantially less because these areas would be avoided during final location and permitting of the facilities. Most of the potential impact area is on private land adjacent to agricultural areas.

The area of impacts to pinyon-juniper woodlands would be about 20 percent larger than with the Proposed Action, but smaller than Alternative A, 560 acres during construction, and 347 acres during operation. These represent 1.7 and 1.0 percent, respectively, of the mapped areas of pinyon-juniper woodland in the Project Area. The types of impacts would be the same as described for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as for the Proposed Action. A larger area would require revegetation after construction of pipelines and at the closure of the project.

4.5.2.7 Alternative D

Alternative D would affect about 9 percent less vegetated lands than the Proposed Action, about 3,722 acres from construction, and 2,134 acres during operation. Impacts would occur mainly in the sagebrush-grass and salt desert vegetation types. Construction activities would affect about two percent of the vegetation in the Project Area, and operational facilities would occupy about one percent of the vegetation. The Project Area would remain largely in natural vegetation, and the largest impacts to any vegetation type would be 2.5 percent (sagebrush-grass).

The acreage of potential impacts to riparian and wetland vegetation would be smaller than the Proposed Action, 64 acres during construction and 37 acres during operation. Actual impacts would likely be substantially less because these

areas would be avoided during final location and permitting of facilities. Most of the potential impact area is on private land adjacent to agricultural areas.

The area of impacts to pinyon-juniper woodlands would be about 13 percent smaller than the Proposed Action, 408 acres during construction and 236 acres during operation. These represent 1.2 and 0.7 percent, respectively, of the mapped areas of pinyon-juniper woodland in the Project Area. The types of impacts would be the same as described for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. The types of revegetation impacts and reclamation requirements would also be the same as the Proposed Action. A smaller area would require revegetation after construction of pipeline and at the closure of the project.

4.5.2.8 No Action Alternative

This alternative would affect slightly less than half the area of the Proposed Action, a total of 1,907 acres of vegetation during construction, and 1,050 acres during operation. Impacts would primarily occur in the sagebrush-grass, salt desert vegetation and agriculture types. Overall, construction would affect about 1.0 percent of the vegetation in the Project Area, and operations facilities would occupy 0.6 percent of the area. The Project Area would remain predominantly in natural vegetation, and the largest proportion of impacts to any vegetation type would be agriculture (1.4 percent).

The acreage of potential impacts to riparian and wetland vegetation would be less than the Proposed Action, 57 acres during construction and 33 acres during operation. As with the Proposed Action, actual impacts would likely be substantially less because of avoidance of these areas during final location, design and permitting of facilities. Most of the potential riparian/wetland impact area is on private land adjacent to agricultural fields.

The acreage of impacts to pinyon-juniper woodlands would be less than half the area affected by the Proposed Action, 171 acres during construction and 86 acres during operation (0.5 and 0.3 percent, respectively of the area of this type in the Project Area). The types of impacts would be the same as for the Proposed Action.

The types of noxious weed impacts would be similar to those identified for the Proposed Action. This alternative would disturb less land than the Proposed Action. Significant increases in noxious weeds would be unlikely. The types of revegetation impacts and reclamation requirements would also be the same as for the

Proposed Action.

4.5.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the seven alternatives is provided in Table 2.8-2. All of the alternatives, including No Action, would involve removal or disturbance of large areas of vegetation. The largest impacts would occur under Alternative A (5,748 acres of construction impacts), and the smallest would be No Action (1,907 acres). Impacts would be scattered through the Project Area, and would not be concentrated in any one area or vegetation type. The proportion of vegetation affected would range from about one to three percent for the various alternatives. The Project Area would remain predominantly in natural vegetation.

The distribution of impacts among vegetation types would be generally similar among all alternatives. The vegetation types with the largest proportions affected in most alternatives would be sagebrush-grass and salt desert, up to 3.8 percent in Alternative A. The area of affected riparian and wetland vegetation has been estimated at 57 to 100

acres under the various alternatives, but is most likely an over-estimate because these areas would be avoided during final siting of facilities. Between 171 and 658 acres of pinyon-juniper woodland would be affected under the various alternatives, in scattered areas, and would have long-term impacts.

All affected areas would be revegetated either immediately following construction, or at the end of the economic life of a facility. All of the alternatives include areas where revegetation may be difficult; and repeated reclamation

efforts may be required to ensure adequate revegetation. The alternatives differ mainly in the extent of surface disturbance which would require reclamation. The Proposed Action and Alternative A would include habitat enhancement of relatively large areas, to make up for losses of browse production in critical mule deer winter range.

A number of noxious weeds could invade the Project Area. Although noxious weeds have not been a major concern on RGC facilities to date, they may become a bigger problem if the area of disturbance greatly increases. Existing regulatory mechanisms are adequate, but would only work with proper monitoring of disturbed areas associated with the project. RGC's commitment to train its personnel in weed identification would help to provide monitoring, if fully implemented.

4.5.4 Mitigation

Existing environmental protection measures would be generally adequate. The following additional mitigations are recommended.

- I. RGC should consider an agreement with the county weed control agencies to perform weed monitoring and control on project facilities, since the counties have certified personnel to monitor and spray.
- II. Locations, procedures, responsibilities, and funding for habitat enhancement projects would be developed in coordination with BLM and UDWR prior to disturbance of mule deer or elk critical winter range.

- III. Impacts to pinyon-juniper woodland should be assessed on a case-by-case basis during final design, and minor relocations of facilities made where appropriate to reduce cutting of trees.

4.5.5 Unavoidable Adverse Impacts

Short and long-term removal and disturbance to vegetation would occur under all alternatives and cannot be avoided, although the area affected would be reduced under some alternatives. Permanent reductions in the area of natural vegetation communities would only occur if project roads are maintained by landowners at the end of the project.

4.6 WETLANDS

4.6.1 Introduction

Potential impacts to wetlands include filling, excavating, clearing and grading, and drainage. These impacts may reduce the area and the functional value of affected wetlands. Short-term impacts may result from construction of pipelines across wetlands, and long-term impacts may be caused by placement of permanent facilities such as well pads or roads in wetlands. Long-term impacts including changes in wetland area or function could also result from improper construction techniques such as placement of culverts and backfill.

Impacts to wetlands are subject to the provisions of Section 404 of the Clean Water Act, and any project feature affecting wetlands would require a permit. Project facilities would most likely be authorized under nationwide permits, including Nationwide Permit No. 12 (utility lines) for pipelines and transmission lines,

and Nationwide Permit No. 14 (road crossings). They might also be covered by Nationwide Permit No. 26 (headwaters and isolated wetlands discharges). Nationwide permits are subject to various conditions and notification requirements designed to minimize impacts. For example, No. 12 requires backfilling of the surface of the trench with topsoil removed from the trench, removal of excess material from the wetland immediately after construction, and immediate stabilization of exposed slopes and streambanks. Nationwide permit No. 14 only applies to fills of less than 200 linear feet of roadway, and filled areas of less than 1/3 acre. Both Nationwide Permits Nos. 14 and 26 require a pre-discharge notification to the COE, including delineation of affected wetland areas. Project features which could not meet the requirements of the appropriate nationwide permits would either have to be redesigned to meet requirements and reduce impacts, or go through an individual Section 404 permit process.

Several of the environmental protection measures described in Section 2.2.5 apply to wetlands, including RGC 7 (reclamation), RGC 8 and 9 (noxious weeds), BLM 1 (siting, including avoidance of wetlands and riparian), BLM 4-5 (avoidance of streams and springs), BLM 6-7 (minimization of disturbance), BLM 8-23 (reclamation and erosion control), BLM 24 (control of wildfire), and BLM 36 (minimization of impacts in wetlands and riparian areas). Requirements for seeding and planting in disturbed wetland and riparian areas on BLM land are provided in Appendix 2F.

Application of these mitigations and of the Section 404 permit conditions would minimize encroachment on wetlands and would help ensure that areas of temporary construction disturbance are adequately restored.

4.6.2 Direct and Indirect Impacts

4.6.2.1 Proposed Action

Specific project impacts on wetlands cannot be accurately assessed prior to wetland delineation, application of environmental protection measure BLM 1, minimizing of encroachment on wetlands (and similar on-site protections on other lands), and initiation of the Section 404 permitting process. This analysis therefore focuses on potential areas of impact: those areas mapped as riparian on federal lands by the BLM, and areas mapped as riparian/wetland in Plate 16. These two sources were mapped by different techniques, and acres from them cannot be directly compared (See Section 3.5). In addition, both sources do not separate wetlands and riparian areas. The ecological differences and similarities between wetland and riparian areas are described in Section 3.5.2. Impacts to wetlands are regulated under the Clean Water Act, and riparian areas (both wetland and non-wetland riparian) are protected under BLM management policies. This section is focused on wetland impacts; areas of riparian and wetland/riparian are presented only as a measure of potential wetland impacts.

On BLM lands, areas mapped as riparian include 4.7 acres of construction impacts and 2.6 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is transportation corridors. Riparian types

include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Project Area, areas mapped as riparian/wetland occupy 73 acres of the proposed construction area, and 42 acres of proposed operations area (Table 4.5-1). These represent, respectively, 1.4 and 0.8 percent of the area mapped as riparian

and wetlands vegetation. Wetlands probably occupy a portion of these areas, but the exact locations and acres are not available.

Areas of potential impact include both proposed wells (about 16.6 acres) and transportation corridors (resource roads). Since wetlands are small and scattered, well sites could easily be relocated short distances to avoid impacts, if wetlands are present at the proposed locations. Some sections of transportation corridors crossing riparian/ wetland areas may also be able to be relocated, but avoidance may not be possible at crossings. Both short and long-term impacts may occur at crossings.

Where construction in wetlands could not be avoided, activities would be subject to Section 404 permit requirements and conditions, and to project stipulations covering construction methods and restoration of affected wetlands. Assuming compliance with the Clean Water Act, wetland impacts would be mostly short-term and within allowable limits. If the amount of wetlands affected exceeds limits set by the COE, compensatory wetland creation could be required. Impacts to wetlands would be considered significant if they were unauthorized, or if they were in violation of permit conditions.

4.6.2.2 Alternative A

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be larger. On BLM lands, areas mapped as riparian include 6.3 acres of construction impacts and 3.4 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Proposed Action, areas mapped as riparian/ wetland occupy 100 acres of the proposed construction area, and 63 acres of the proposed operations area. These represent, respectively, 2.0 and 1.3 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would provide 30.7 acres of these potential impacts.

4.6.2.3 Alternative B1

The types of impacts and mitigations would also be similar to the Proposed Action, and the area of potential impact would be similar. On BLM lands, areas mapped as riparian include 4 acres of construction impacts and 2 acres of operational impacts. Nearly all of this area is in transportation corridors. Riparian types include cottonwood, tamarisk, and perennial and annual forbs and grasses. In the entire Project Area, impacts to areas mapped as riparian/wetland would be the same as the Proposed Action: 73 acres of the proposed construction area, and 42 acres of the proposed operations area, representing 1.4 and 0.8 percent of the mapped area. Wells would provide 16.6 acres of these potential impacts.

4.6.2.4 Alternative B2

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be greater. On BLM lands, areas mapped as riparian include 5.5 acres of construction impacts and 2.8 acres of operational impacts. Nearly all of this area would be affected by transportation corridors. Riparian types include cottonwood, tamarisk,

and perennial and annual forbs and grasses. In the entire Project Area, areas mapped as riparian/wetland occupy 100 acres of the proposed construction area, and 63 acres of the proposed operations area. These represent, respectively, 1.9 and 1.2 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would provide 30.7 acres of these potential impacts.

The types of impacts and mitigations would be similar to the Proposed Action, and the area of potential impact would be similar. On BLM

4.6.2.5 Alternative C1

lands, areas mapped as riparian include 4.4 acres of construction impacts and 2.4 acres of operational impacts. About 0.5 acres are at

proposed wells, and the remainder is in transportation corridors. In the entire Project Area, impacts to areas mapped as riparian/wetland would be the same as for the Proposed Action: 73 acres of the proposed construction area, and 42 acres of the proposed operations area, representing 1.4 and 0.8 percent of the mapped area. Wells would provide 16.6 acres of these potential impacts.

4.6.2.6 Alternative C2

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be larger. On BLM lands, areas mapped as riparian include 5.8 acres of construction impacts and 3.2 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder is in transportation corridors. In the entire Project Area, impacts to areas mapped as riparian/wetland would be 100 acres of the proposed construction area, and 63 acres of the proposed operations area, representing 1.9 and 1.2 percent of the mapped area. Wells provide 31 acres of these potential impacts.

4.6.2.7 Alternative D

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential affects would be reduced. On BLM lands, areas mapped as riparian include 4.4 acres of construction impacts and 2.4 acres of operational impacts. About 0.5 acres are at proposed wells, and the remainder are in transportation corridors. In the entire Project Area, impacts to areas mapped as riparian/wetland would be reduced to 64 acres for construction, and to 37 acres for operation. These represent 1.2 and 0.7 percent of the mapped area. Proposed wells would provide 14 acres of these potential impacts.

4.6.2.8 No Action

The types of impacts and mitigations would be similar to the Proposed Action, but the area of potential impact would be less. On BLM lands, areas mapped as riparian include 0.7 acres of construction impacts and 0.4 acres of operational impacts. All impacts would be from transportation corridors. The only riparian type affected would be cottonwood.

In the entire Project Area, areas mapped as riparian/wetland occupy 57 acres of the proposed construction area, and 33 acres of the proposed operations area. These represent, respectively, 1.2 and 0.7 percent of the area mapped as riparian and wetland vegetation in the Project Area. Wells would provide 13.0 acres of these potential impacts.

4.6.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the seven alternatives is provided in Table 2.8-2. All of the alternatives have the potential to adversely affect wetland area and functions. The area of potential effect is greatest for Alternatives A, B2, and C2; less for the Proposed Action and Alternatives B1, C1, and D (about 65 to 70 percent of Alternative A); and least for No Action (about 50 percent of Alternative A). Although the actual extent of impacts cannot be determined now, the probable extent of adverse effects are likely to be roughly proportional to the potential area of effect. More miles of transportation corridors are likely to result in more wetlands that cannot be avoided. However, all alternatives would be subject to the same permitting and mitigation requirements, ensuring that impacts would be acceptable under the provisions of the Clean Water Act.

4.6.4 Mitigation

Environmental protection measures applicable to wetlands have been presented above. They include permitting and compliance requirements under Section 404 of the Clean Water Act, and some project wide-mitigations and BLM stipulations. No additional mitigations are required. Mitigation requirements under the Clean Water Act would depend on the nature of the impact and the characteristic of the affected aquatic resource.

4.6.5 Unavoidable Adverse Impacts

Unavoidable reductions of wetland area and functions may occur at transportation crossings. Short-term adverse effects could occur from pipeline construction, and long-term adverse effects from road construction and operation. The extent of losses cannot be quantified with existing information. However, all activities in wetlands will be subject to the provisions of Section 404 of the Clean Water Act, and impacts will be consistent with COE implementation of Section 404.

4.7 WILDLIFE

4.7.1 Introduction

This section is organized to describe:

- I. The specific phases of gas field development (construction, operation, and abandonment/reclamation) that may affect wildlife, and environmental protection measures designed to minimize impacts
- II. The direct and indirect impacts for big game, raptors, and species of management concern, to serve as the basis for analysis of impacts of each of the alternatives
- III. Actual impacts by alternative for the major species present in the Project Area.

The Price CBM Project would occur in several phases, which would have different effects on wildlife based on the type and extent of activity:

Construction

This phase includes pre-construction permitting and siting of facilities, construction of well pads, pipelines, electrical utilities, produced water disposal facilities, and compressor stations; construction or improvement of access roads; and drilling and completion of gas wells. These activities would require numerous personnel and equipment. They would occur over a period of several months in any single year, and would take 6 to 10 years to complete for all of the proposed facilities.

In general, construction activities would be clustered in specific geographic areas in any

one year (Plate 3), and would not be dispersed throughout the Project Area. About 40 percent of the area disturbed by construction would be reclaimed within the same year (areas used for pipeline and electrical powerline construction). The remainder of the area disturbed during construction would be occupied by aboveground facilities for the life of the project.

Operation

Wells would operate for approximately 20 years. During this period, human activity would be less than during construction but would continue throughout the year. The primary activities which may have the greatest effect on wildlife would be human activity during the winter associated with regular visits to well pads, facility maintenance, road maintenance and snow removal, and increased use of the area by the public. Gas production, treatment and collection, compression, and produced water disposal would involve minimal personnel in the field except at compressor stations and water disposal facilities.

Abandonment and Reclamation

At the end of the operational life of each well, RGC would remove its facilities, and reclaim well sites and access roads. Access roads would be left in place if requested by the landowner. These activities would involve a short-term increase in people and vehicles in the Project Area. Abandonment and reclamation activities would require approximately three days per well and four days per mile of access road, for a crew of 4 people.

A number of environmental protection measures are required by law or by agency regulation, or committed to by RGC (Section 2.2.5). Measures specifically developed for protection of wildlife include RGC 10, RGC 11, RGC 12, RGC 14, RGC 15, and RGC 16, and BLM 37, BLM 38, BLM 39, and BLM 40. In addition, environmental protection measures governing placement of facilities, reclamation, and other activities would also serve to reduce

impacts to wildlife.

Two major environmental protection measures are included in the description of the Proposed Action (Section 2.2): restriction of construction on federal land within one-half mile of a raptor nest classified as occupied within a three year period, and development of gates on access roads, which would be closed in winter to limit disturbance to wintering big game.

4.7.2 Direct and Indirect Impacts

The following general discussion of the direct and indirect impacts of CBM development on big game, raptors, and other species of management concern is intended to lay the foundation for the discussion of impacts for the Proposed Action and alternatives.

Big Game

Big game species present in the Project Area include mule deer, elk, pronghorn antelope, moose, black bear and mountain lion. Direct and indirect effects on big game species would occur during each project phase, but the magnitude of effects would vary depending on the type of activities, the species affected, and the seasonal sensitivity of the species and its habitat.

During the construction phase, the most important direct impact would be habitat loss due to construction of facilities. About 40 percent of the disturbed area would be reclaimed immediately, although revegetation may require several years. The other 60 percent of the affected area would be occupied by well pads, roads and other facilities, and would represent a long-term habitat loss. These losses would be partially replaced by habitat enhancement projects required by BLM for direct impacts on federal lands. Similar

requirements may be applied on UDWR lands. No habitat enhancement projects would be on State Trust or private lands. These areas represent 38 to 70 percent of the surface disturbed areas of the seven alternatives.

Indirect impacts due to displacement would also occur during construction, and would adversely affect wildlife resident in the area during the construction period. Wintering big game would be unlikely to be affected because most (or all) of the construction would occur during the summer and fall, when wintering big game are not present in the Project Area.

During the operation phase, direct impacts from removal of habitat would continue, offset to some extent by enhancement of other habitat. In addition, because of the greatly increased network of roads and increased RGC and public use of the road network, there would be increased mortality and injury from big game collisions with vehicles and from legal and illegal hunting. However, the most important impacts during operation would be the indirect effects from displacement and harassment of big game on critical and high value habitat during the critical season. This is described more fully below.

The abandonment phase would primarily have positive direct impacts, by removal and reclamation of facilities. Indirect impacts would be similar, but of lesser magnitude, to the construction phase.

The greatest impact to big game would likely be disturbance caused by increased human activity, equipment operation, vehicle traffic and noise. In this case habitat would not be physically altered in any way but affected by the presence of these activities. Big game animals would avoid or move away from these types of disturbance to other habitat areas. This

avoidance is referred to as displacement and would result in underuse of habitat near the disturbance. The impact would be that the value of the habitat near the disturbance would be decreased and would not support the same level of big game use as long as the disturbance remained. Another impact associated with this avoidance or displacement would be alteration of natural distribution patterns, resulting in increased or concentrated use of other habitat areas including areas on Manti La Sal National Forest and private lands. This would lead to overuse and degradation of habitats where big game are concentrated.

Displacement or loss of habitat value for big game has been documented by numerous researchers (Lyon 1985, Ward 1976, Ward et al. 1980, Rost and Bailey 1979). These researchers found that disturbance associated with human presence and traffic on roads reduces the use of habitat by big game adjacent to the activity. The distance big game move away from these activities ranges from 200 meters for deer to well over 800 meters for elk. The actual distance big game move to avoid vehicle traffic and other human disturbance is influenced by topography, presence of vegetation that may screen the disturbance and intensity of the disturbance. Avoidance is greatest along more heavily traveled secondary or dirt roads (Rost and Bailey 1979, Perry and Overly 1976). Other factors affecting road avoidance by big game include slower traffic speed, vehicles that stop, and traffic with associated out-of-vehicle activity. All of these factors are known to increase the distance big game move away and are typical of traffic associated with gas field activity.

Most species of big game are known to adapt to human related disturbances to some degree or another. For example, deer and pronghorn would adapt to heavy traffic associated with paved roads and characterized as constant speed with no-out-of-vehicle human activity (Ward et al. 1980, Ward 1976, Richardson 1992). Several factors influence the likelihood of big game populations to adapt to human related disturbances. Non-migratory and non-hunted populations of big game are more likely to adapt than migratory or hunted populations. Mule deer and elk populations in the CBM Project Area are migratory and are hunted immediately prior to their arrival on winter range in the Project Area. Based on these factors specific to the Project Area, big game are not expected to readily adapt to the human related disturbances associated with the gas field operation.

Displacement results in underuse of habitat near disturbances (loss of habitat value), overcrowding on the remaining habitat, increased competition for space with other species, areas of overuse, and decreased physical condition of the population. Other effects of increased stress and harassment may include a reduction in reproduction rates, and increase in winter mortality due to increased energy use. Increased expenditures of energy could be particularly significant during severe winter conditions when mortality of fawns is high due to natural conditions. Displacement effects would result in reductions in carrying capacity; although the physical habitat would still be present, the animals would use it to a much lesser extent than before the disturbance. Loss of carrying capacity may in turn result in long-term reductions in big game populations,

especially if alternative habitat areas are unavailable or already occupied. Displacement is of greatest concern in areas which have been recognized as critical habitat, areas essential for the maintenance of the local populations. Displacement effects combined with increased direct mortality from vehicle collisions, and legal and illegal harvest could result in unit-wide reductions in populations.

The magnitude of displacement and actual reduced habitat value would vary depending on road use, traffic levels, topography, vegetative cover and slope. The analysis of displacement areas for big game follows a two-step approach, as described in Appendix 4B. This involves (1) mapping of displacement zones, and (2) assessment of effects on habitat value based on expected levels of human activity. The analysis of indirect impacts used a one-half mile displacement distance for elk, and one-eighth mile for mule deer. These represent average displacement distances, and animals may occur within these buffer zones where levels of human activity are low or when sufficient cover is present. Similarly, animals would be displaced at distances wider than the buffer zones where levels of human activity are high and cover is not available. Average use of habitat is expected to increase gradually with distance from roads and facilities. The zones of reduced use along the roads would partially fragment the habitat but would not present a complete barrier to movement, such as would occur from a housing development or reservoir.

Raptors

Raptors nesting in or near the Project Area include golden eagle, Cooper's hawk, red-tailed hawk, ferruginous hawk, prairie falcon, peregrine falcon, American kestrel, Great horned owl, and burrowing owl.

During the construction phase, disturbance and stress associated with human activity in the vicinity of a raptor nest would cause indirect impacts, including nest abandonment or loss of young. Sensitivity varies by type of disturbance and species; for example, breeding ferruginous hawk are considered to be very sensitive, while red-tailed hawks are much less sensitive. Nesting birds would be more sensitive to disturbance in the line of sight from a nest (e.g., below a cliff nest) than to activities not in the line of sight.

The direct impact (destruction of active raptor nests or disturbance to nests resulting in disruption of the nesting cycle or mortality of young) is illegal under federal law and should not occur under any alternative. There would be no aboveground electrical transmission lines associated with the project, so electrocutions and power line collisions are not an issue.

The raptor prey base would be reduced by construction activities. Small mammal populations would be affected most, because of their limited mobility. Some animals would be destroyed during the construction phase, or displaced from their preferred habitat. Animals displaced due to physical habitat loss would be subject to a greatly increased chance of predation and would likely not survive.

Impacts during operation are likely to be less adverse. Raptors will adapt to human activities in varying degrees, and may even build nests near frequent non-threatening human activity,

such as a road.

The abandonment and reclamation phase would have positive effects, from reduction of human activity.

Four environmental protection measures would help to limit indirect effects on nesting raptors. Environmental protection measure BLM 40 restricts well construction on federal land within one-half mile of any raptor nest active within the previous three years, unless site-specific evaluations indicate that there would be no adverse effects. Road and pipeline construction may occur after the seasonal closure. Protective windows established by BLM (USDI, BLM 1984a) for the raptor species in the Project Area include:

- I. Golden eagle - February 1 to June 15
- II. Cooper's hawk - April 15 to July 15
- III. Red-tailed hawk - February 15 to June 15
- IV. Ferruginous hawk - March 15 to June 15
- V. Prairie falcon - March 15 to June 15
- VI. American kestrel - April 15 to July 15
- VII. Great horned owl - January 15 to May 1
- VIII. Burrowing owl - April 15 to July 15

Raptor nest locations on federal lands would be identified during annual raptor nest surveys

(environmental protection measure BLM41). Annual monitoring would not be required on other lands, except potentially on UDWR lands.

For other, non-federal lands, RGC has committed to RGC 14, a seasonal (nesting

season) limit on construction within one-half of raptor nests, unless not warranted by site conditions or regulation. This protection measure may not be effective without annual monitoring to identify nesting activity. In addition, UDOGM includes on its drilling permits a stipulation providing for seasonal (February 15 to July 15) restriction on drilling within one-half mile of nesting raptors, when requested by UDWR. RGC 14 and UDOGM protection measures do not prevent disturbance of raptor nesting activity associated with field production activity. Under these protection measures, field production facilities could be located next to nest sites which could lead to mortality of young during the subsequent nesting season or abandonment of the nest site.

During the construction phase of the Price CBM Project, construction would normally not occur within one-half mile of active raptor nests during the active season, on both federal and non-federal lands. Exceptions would include nests where federal and/or state wildlife biologists have concluded a less restrictive measure would provide equivalent protection. On federal lands, wells would not be constructed within 0.5 miles of nest sites that have been documented as occupied within the previous three years. On non-federal lands, wells could be constructed after the end of the

seasonal window, and those wells and the associated human activity would potentially displace breeding pairs to alternative nesting sites upon their return to the nesting territory in the following year.

During operation, adverse impacts are not likely to occur for nest sites on federal lands due to environmental protection measures BLM40 and BLM41. However, adverse impacts may occur to nesting raptors on non-federal lands. RGC 14 and UDOGM protection do not preclude construction of facilities immediately adjacent to raptor nest sites. Human presence and associated field maintenance operations in the nesting season could cause mortality of young in the nest and/or abandonment of the nest site. Nesting raptors that are affected may be forced to construct or select other nest sites in areas with lower prey bases which may not be capable of supporting nesting pairs of raptors. Some raptors may be injured or killed in collisions with vehicles. The increased road network would provide much more public access, and illegal shooting could cause some losses of raptors. Minor losses of habitat for prey populations would be offset to some extent by increased security cover from culverts, cattleguards, and other developments. Impacts associated with abandonment and reclamation would be minor.

Other Species of Management Concern

Impacts to other species of management concern are discussed under the Proposed Action (Section 4.7.2.1). Those include sage grouse and other upland game, song birds, and reptiles and amphibians.

4.7.2.1 Proposed Action

The Proposed Action would involve the construction of 601 wells, 350 miles of existing roads, and various other facilities over a six to ten year period. Direct (actual habitat loss) and indirect (displacement) impacts are summarized below.

Mule Deer

Construction. A summary of the direct effects on habitat is presented in Table 4.7-1, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation within important mule deer habitats. This would include 1,341 acres of impact in mule deer critical winter range (2.5 percent of this habitat within the Project Area), and 1,191 acres of impact in mule deer high value winter range (2.3 percent). There would be no impacts to critical summer habitat. There would be large areas affected within limited value yearlong habitat, but impacts to this habitat is of low significance compared to other habitat types. Acres of impacts are provided in the tables, but are not discussed further in the text.

Although presented as one number in Table 4.7-1, construction impacts would be spread over 6 to 10 years, and construction within mule deer critical or high value winter habitat would probably occur in about two-thirds of the construction years. During the remaining years, it would be occurring in other portions of the Project Area. Within each year, about 40 percent of the area disturbed would be revegetated, and the remainder would be occupied by various facilities for the life of the project. The project-long total of areas occupied by operational facilities would be 754 acres in mule deer critical winter range (1.4 percent of

available habitat in the Project Area), and 712 acres in high value winter range (also 1.4 percent).

Environmental protection measure BLM 38 requires that areas affected by construction on BLM land be mitigated by upgrading of adjacent habitat to allow for increased use by wildlife, in order to maintain the same carrying capacity for the overall habitat. Actual habitat enhancement projects would be identified from those described in the wildlife mitigation plan (Appendix 4C). Of the 1,341 acres of direct impact in mule deer critical winter range, 889 acres would be on federal lands, and would be compensated for by this environmental protection measure. This represents about 66 percent of the total area of critical winter range affected by construction. These habitat improvement projects would be subject to environmental review and compliance requirements, such as NEPA and cultural resource clearances.

Impacts to high value habitat would also be significant unless mitigated. BLM has developed a new mitigation as a result of the EIS process, which states: "Where disturbance exceeds 10 acres in elk or mule deer high value winter range, an equivalent acreage of adjacent habitat will be upgraded to accommodate increased use, and is to be completed commensurate with surface disturbing activity." Of the 1,191 acres of direct impact on mule deer high value winter range, 690 acres (58 percent) is on federal lands and would be compensated for by this mitigation.

Areas of direct effect on non-federal lands (452 acres of critical winter range and 501 acres of

high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent 0.9 percent of the winter range in the herd unit and are considered significant.

Indirect (displacement) effects of construction on mule deer would likely be minor, because little construction would occur during critical wintering seasons. On BLM lands, environmental protection measure 37 requires that drilling and development only be done from May 16 to October 31 in winter range. It is RGC's intent to be completed with construction by the end of October at higher elevations. As a worst case, construction in those areas might extend to mid-December. For non-federal lands, UDOGM includes seasonal restrictions as a stipulation on their permits to drill when requested by UDWR; these stipulations state that construction should be restricted from December 1 to April 15.

Increases in mortality from collisions and increased legal and illegal hunting would be minor during construction, because few mule deer would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy mule deer critical and high value winter range. The project-long total of areas occupied by operational facilities would be 754 acres in mule deer critical winter range (1.4 percent of available habitat in the Project Area), and 712 acres in high value winter range (also 1.4 percent). This loss of habitat would be offset by increases in carrying capacity resulting from

habitat improvement programs (see above), but there would be no large undisturbed blocks of land available within the Project Area.

Wintering mule deer would be subject to disturbance, stress, and displacement where key wintering habitats overlap with project facilities. At full operation (years 10 to 20), 205 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 162 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be 112 miles of roads servicing gas field facilities in critical winter habitat, and 98 miles of roads in high value winter habitat. Some of these roads are currently existing but would be upgraded, and others would be new. Well field maintenance personnel would visit each well approximately once every three days, and roads would be kept clear of snow. The road network would be open to the public year-round except where gates were closed in winter, and is assumed to result in higher public use of the area.

Displacement of mule deer from project facilities was analyzed using a distance of 200 meters. This distance was selected as an average among ranges of displacement distance reported in the scientific literature (Ward et al. 1980, Rost and Bailey 1979), and was suggested by the UDWR (Moretti 1995). Reduced mule deer use has been reported up to one-quarter mile from roads (Woodward-Clyde 1995b), and one-eighth mile is commonly used for management and impact analysis. Because wells, compressors, and other facilities would all be adjacent to roads, displacement of mule deer from these facilities is assumed to fall within the 200 meter buffer. The total area of displacement would be 17,367 acres (32 percent

of available habitat in the Project Area) in critical winter range; and 15,829 acres (31 percent) in high value winter range.

Winter road closure is included as part of the Proposed Action in order to reduce impacts to wintering big game. Where road closures could be implemented, habitat value within the displacement area would be increased, because of reductions in traffic volume and human presence. Although mule deer would be subject to the same displacement distance as in non-closed areas, they would have a reduced frequency of disturbance. Methods of estimating habitat value, including beneficial results of road closures, are presented in Appendix 4B. With closure of selected roads during winter, there would be 10,280 acres of reduced habitat value in critical winter range (19.1 percent of available habitat in the Project Area), and 11,135 acres of reduced habitat value in high value winter range (21.5 percent) (Table 4.7-2).

Reductions in habitat value would be likely to lead to reductions in local and management unit-wide mule deer populations. All of the proposed RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. The critical and high value winter habitat within the Project Area represents about 71 percent of the 148,000 acres of winter range within this unit, including nearly all of its critical winter range. Critical winter range by definition is typically the range most limiting to the survival of a mule deer herd. This is true for the Northeast herd unit as this herd unit has ample summer range and very limited winter range. Because critical winter range is the limiting factor for the herd, effects to or losses of critical winter range directly affect population carrying capacity of the herd. This effect to population carrying capacity is

assumed to be proportionate to the affected habitat. Based on this analysis, the mule deer carrying capacity in the Project Area would be reduced by 19 percent. Since about 95% of the critical winter range in the Northeast Manti herd lies within the Project Area (Bates 1996a), an 18 percent reduction in the carrying capacity of the Northeast Herd unit would be expected. This would mean that the target winter population for the Northeast herd unit would be reduced by 2,520 deer or from 14,000 to 11,480 (Table 4.7-3). The target buck harvest would be reduced by 252 bucks from 1400 to 1148. Although summer range would not be affected by the Proposed Action, populations of mule deer on summer ranges would also be reduced to the same degree. The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Displacement and population impacts can be reduced by implementing mitigations which reduce conflicting uses, such as acquisition of habitat or changes in livestock management to allocate more grazing to wildlife. Determining appropriate and reasonable mitigation to address impacts of disturbance/displacement on 21,415 acres of winter range is very difficult. However, BLM has developed and implemented a mitigation standard for this type of impact in all previous CBM gas field development with similar habitat values within the Price River Resource Area. In the previous two CBM developments, mutual agreement was reached between BLM, CBM company officials and UDWR that a one time payment of \$750 per well (regardless of surface or mineral ownership) be made into an account established

specifically for this purpose. This was considered reasonable to address disturbance/displacement impact to mule deer, elk, black bear and mountain lion in similar habitats. These agreements were reached in 1993 and 1996.

A BLM mitigation measure developed for this project (Appendix 4C) requires: "The proponent shall participate in a Wildlife Habitat Impact Mitigation Program similar to that developed for the Castlegate Coalbed Methane EIS and for the Helper Coalbed Methane Field. Participation shall involve entering into a cooperative agreement and providing a monetary contribution on a per well basis into a dedicated account managed by BLM and the Utah Division of Wildlife Resources." This mitigation would involve a one-time payment of \$750 (1996 dollars) per well, both on federal and non-federal lands. Funds accumulated in this mitigation account would then be used to effect a change in surface management that would directly benefit big game, mountain lion, and black bear. Application of this mitigation would reduce the magnitude of indirect impacts to deer, but would not eliminate them.

Increased mortality would also be likely to occur during project operation, due to vehicle collisions, legal and illegal hunting, and harassment of mule deer. These would all be likely to increase because of the greatly expanded network of roads within critical and high value winter range, and because roads would be kept open (free of snow) during the winter. Both of these factors may lead to greatly expanded traffic volumes, but the magnitude of adverse effects on mule deer are difficult to predict.

The potential for collisions would be greatest during the winter months when big game is concentrated at lower elevations and days are short, and at night when visibility is reduced. The magnitude of impacts depends on traffic volume, vehicle speed, habitat openness and visibility, and driver awareness. The design speeds for the various road types are relatively low and may help to reduce the potential for collisions: 25 mph for collector roads, 20 mph for local roads, and 15 mph for resource roads. RGC would require its employees and contractors to maintain these speed limits (environmental protection measure RGC 12). This requirement may be difficult to enforce in the field, and non-RGC users would not be subject to it, but road conditions would be likely to limit excessive speed. RGC would also use a remote monitoring system which reduces the frequency of visits to wells. Gates would restrict public access during winter on about 60 percent of roads in critical winter range and 45 percent of roads in high value winter range, greatly reducing the potential for adverse effects from collisions in those areas.

The enlarged and improved road network would make the area more accessible to both legal and illegal hunting, and to deliberate and unintentional harassment, and would make detection of illegal hunting more difficult. According to UDWR (Gramlich 1996), current levels of illegal hunting appear to be low because of low mule deer populations, but poaching was much greater in the 1980s when numbers were higher. Unintentional disturbance of wildlife may occur from people stopping vehicles and getting out to watch wildlife. Harassment of wildlife, especially in winter, may lead to increased mortality through stress. The potential for hunting and harassment of wildlife by RGC personnel would be reduced by implementation of environmental protection

measures RGC 10 (no firearms or pets for RGC employees and contractors while on the job), and RGC 11 (training of employees and contractors regarding wildlife protections). The potential for illegal hunting and harassment by non-RGC employees would be reduced by winter gate closures.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to mule deer, because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when mule deer would mostly be at higher elevations and not under stress.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector and local roads, and resource roads that were improved from pre-project roads would be likely to be kept.

Elk

Construction. A summary of the direct effects on elk habitat is presented in Table 4.7-4, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines, and other facilities would involve disturbance or removal of existing vegetation within important elk habitats. There would include 808 acres of impact in elk critical winter range (2.6 percent of this habitat within the Project Area), and 1,651 acres of impact in elk high value winter range (2.4 percent). There would be no direct effects on critical summer or yearlong habitat. The project would also affect substantial value winter habitat, and a small amount of limited value winter habitat. Impacts on substantial value winter habitat and limited value yearlong habitat are presented in the summary tables, but are not discussed further in the text because of the lower significance compared to critical and high value habitat.

Although presented as one number, construction would be spread over 6 to 10 years, and impacts to elk critical or high value winter habitat would probably occur in about two-thirds of the construction years. During other years, construction would be occurring in other portions of the Project Area. Within each year, about 40 percent of the area disturbed would be revegetated, and the remainder would be occupied by various facilities for the life of the project. The project-long total of areas occupied by operational facilities is 476 acres in elk critical winter range (1.6 percent of available habitat in the Project Area), and 951 acres in high value winter range (1.4 percent).

Environmental protection measure BLM 38

requires that critical habitat affected by construction on BLM land be mitigated by upgrading of adjacent habitat to allow for increased use by wildlife, in order to maintain the same carrying capacity for the overall habitat. Of the 808 acres of direct impact in elk critical winter range, 73 acres are in lands with BLM surface ownership, and would be compensated for by this environmental protection measure. This represents about 46 percent of the total area of critical winter range affected by construction. Impacts to high value habitat on federal lands would be similarly mitigated, based on the BLM mitigation measure developed as a result of the EIS process, and discussed under mule deer. Of the 1,651 acres of direct impact on elk high value winter range, 1,140 acres (69 percent) would be on federal lands and would be compensated for by this mitigation. Areas of direct effect on non-federal lands (435 acres of critical winter range and 511 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 1.0 percent of the winter range in the Project Area, and are considered significant.

Indirect (displacement) effects of construction on elk would be minor, because little construction would occur during critical wintering seasons. On BLM lands, environmental protection measure 37 requires that drilling and development only be done from May 16 to October 31 in critical winter range. It is RGC's intent to be completed with construction by the end of October at higher elevations. As a worst case, construction in those areas might extend to mid-December. For non-federal lands, UDOGM includes seasonal

restrictions as a stipulation on their permits to drill when requested by UDWR; these stipulations state that construction should be restricted from December 1 to April 15.

Increases in mortality from collisions and increased legal and illegal hunting would also likely be minor during construction, because few elk would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy elk critical and high value winter range. The project-long total of areas occupied by operational facilities would be 476 acres in elk critical winter range (1.6 percent of available habitat in the Project Area), and 951 acres in high value winter range (1.4 percent). This loss of habitat may be offset to some extent by increases in carrying capacity resulting from habitat improvement programs (see above), but there would be no large undisturbed blocks of habitat suitable for human enhancement projects within the Project Area.

Wintering elk would be subject to disturbance, stress, and displacement where key wintering habitats overlap with project facilities. At full operation (years 10 to 20), 117 production wells, 1 injection wells, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 241 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be 68 miles of roads servicing gas field facilities in critical winter habitat, and 144 miles of roads in high value winter habitat. Some of these roads are currently existing but would be upgraded, and others would be new. Well field maintenance

personnel would visit each well approximately once every three days, and roads would be kept clear of snow. The road network would be open to the public year-round except where gates are closed in winter, and would contribute to higher public use of the area.

Displacement of elk from project facilities was analyzed using a displacement distance of 800 meters. This distance was selected as an average among ranges of displacement distance reported in the scientific literature (Lyon 1985, Ward 1976, Ward et al. 1980, Ward 1985, Ward and Cupal 1979, Edge and Marcum 1985, Rost and Bailey 1979, and Irwin and Peek 1983), and was suggested by the UDWR (Moretti 1995). The width of the area avoided by elk has been reported as 0.25 to 1.8 miles or more, depending on the amount and type of traffic, quality of road, and density of cover adjacent to the road (Lyon and Ward 1982, Woodward-Clyde 1995b). Because wells, compressors and other facilities would all be adjacent to roads, displacement of elk from these facilities is assumed to fall within the 800 meter buffer. The total area of displacement is 26,380 acres in critical winter range (87 percent of available habitat in the Project Area; and 52,988 acres in high value winter range (78 percent of available habitat). Elk would also be displaced from large portions of substantial value winter habitat, limited value winter habitat, and a small area of critical summer habitat.

Winter road closure is included as part of the Proposed Action in order to reduce impacts to wintering big game. Where road closures were implemented, decreases in habitat value would likely be reduced, because of lower traffic volume and human presence. Although elk would be subject to the same displacement distance as in non-closed areas, they would have a reduced frequency of disturbance. The

methods of estimating loss of habitat value are presented in Appendix 4B. There would be 10,815 acres of reduced habitat value in critical winter range (36 percent of available habitat in the Project Area), and 37,892 acres in high value winter range (56 percent) (Table 4.7-5). There would also be substantial reductions in habitat value on substantial value winter habitat and limited value winter habitat. Reductions in critical summer range would be minor, because only a small portion of critical summer range is located in the Project Area.

Reductions in habitat value would be likely to lead to reductions in local and management unit-wide elk populations and harvest. All of the proposed RGC facilities in critical and high value winter range would be located within the Manti herd unit. About 30 percent of the elk from this herd unit winter within the RGC Project Area, about 2,500 to 3,000 animals (Bates 1996a). Assuming that reductions in winter carrying capacity would be proportionate to loss of habitat value in critical winter habitat, the project would affect about 36 percent of the elk winter carrying capacity in the Project Area, and about 11 percent of winter carrying capacity in the entire herd unit. Assuming that overall population effects would be proportional to losses of critical winter range, this would result in an estimated reduction in the target Manti elk herd of 1,210 elk, and a reduction in the target bull harvest of 143 bulls (Table 4.7-6).

Displacement and population impacts can be reduced by implementing mitigations which reduce conflicting uses, such as acquisition of habitat or by changes in livestock management to allocate more grazing to wildlife. Funds

provided by the Wildlife Habitat Impact Mitigation Program (described under mule deer and in Appendix 4C Wildlife Mitigation Plan) would reduce the magnitude of indirect impacts to elk, but would not eliminate them.

As with mule deer, increased mortality would be likely from vehicle collisions, hunting and harassment. A detailed discussion of these issues is provided under mule deer.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to elk because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when elk are mostly at higher elevations and are not under stress.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector and local roads, and resource roads that were improved from pre-project roads, would be expected to be kept.

Black Bear

Construction. A summary of the direct effects on habitat is presented in Table 4.7-7, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation within yearlong high value black bear habitat: 566 acres of direct impact (2.1 percent of the habitat within the Project Area. Construction would be spread over 6 to 10 years, but impacts to black bear habitat would probably occur in about one-third of the construction years. Avoidance of streams and associated riparian areas (environmental protection measure BLM 4) would reduce potential impacts.

Construction would occur during summer and early fall months, when black bears are active, and black bears would likely be displaced from construction areas. Applying the same displacement distances for bear as for elk (800 meters), bear would be displaced from 22,330 acres (84 percent of their habitat in the Project Area) at some point during construction (Table 4.7-8).

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy black bear high value yearlong habitat. The project-long total of areas occupied by operational facilities would be 331 acres (1.2 percent of available habitat in the Project Area).

Black bear would continue to be subject to disturbance, stress, and displacement from human activities associated with facilities located within their habitat. At full operation (years 10 to 20), 65 production wells, 1 injection

well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 48 miles of roads to CBM field facilities within black bear habitat. Assuming an 800 meter displacement distance, black bear would be eliminated from about 84 percent of the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to black bear. Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions, and bear populations may return.

Mountain Lion

Construction. For analysis, mountain lion habitat is assumed to be the same as mule deer habitat, and direct impacts to habitat would be the same. Direct impacts to mountain lions would be minor during construction, because destruction of a breeding den or mortality from a vehicle collision would be unlikely. Indirect impacts may occur to resident mountain lions during construction, and result in displacement of mountain lions from areas within 800 meters of construction. However, mountain lion populations would be likely to be lower in the Project Area during the construction season when deer and elk are at higher elevations, compared to the winter when prey animals are concentrated on their winter habitat.

Operation. Direct impact to mountain lion

habitat during the operational period would be the same as for mule deer. Indirect impacts would be significant. Mountain lion are more sensitive to human disturbance than deer. Assuming an 800-meter displacement distance (similar to elk), mountain lion would be displaced from about 78 percent (82,700 acres) of mule deer critical and high value winter habitat. This could result in a proportionate decrease in the mountain lion harvest from 6 to 1. Winter road closure may reduce this impact, but habitat fragmentation and reduction in the deer and elk herds may eliminate mountain lion from all but the most rugged portions of the affected area.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have only minor direct or indirect impacts. Following reclamation, conditions in the Project Area would tend to return to pre-project conditions, and mountain lion populations should recover.

Pronghorn Antelope

Construction. A summary of the direct effects on habitat is presented in Table 4.7-9, for the Proposed Action and each of the other alternatives. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of 871 acres of existing vegetation within antelope high value yearlong habitat (1.8 percent of habitat available in the Project Area), and 649 acres of potential antelope habitat (1.0 percent). Impacts to antelope would probably occur in about half of the construction years.

Pronghorn antelope exhibit high levels of

adaptability to human disturbance and have been found to adapt to increased traffic volumes (Reeve 1984, Ward et al. 1980). Based on these studies, displacement of antelope during construction was analyzed using a displacement distance of 100 meters from roads. Displacement from other facilities is assumed to fall within the 100 meter buffer. Antelope would be displaced from 6,088 acres of high value yearlong habitat (12 percent of that type available in the Project Area) (Table 4.7-10).

Increases in mortality from collisions and increased legal and illegal hunting would likely be minor during construction, because there are already numerous roads within pronghorn habitat in the Project Area.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy pronghorn habitat. The project-long total of areas occupied by operational facilities would be 511 acres in pronghorn high value yearlong range (1.0 percent of available habitat in the Project Area), and 349 acres in potential habitat (1.2 percent).

Displacement effects would continue during operation, but pronghorn may adapt to project facilities and routine human activities within yearlong high value habitat. At full operation (years 10 to 20), 147 production wells and 76 miles of new or improved roads would be located in high value winter habitat. Displacement effects may limit expansion of antelope populations into the potential habitat west of Highway 10; project facilities planned for that area include 81 wells, 3 evaporation

ponds, 3 injection wells, and 1 compressor station, along with 79 existing wells. Displacement effects would be unlikely to have significant adverse effects on antelope populations, because less than 1 percent of habitat available within the herd unit would be affected. In addition, no critical habitat would be affected.

The enlarged and improved road network would make the area more accessible to both legal and illegal hunting, and to deliberate and unintentional harassment. The potential for hunting and harassment of wildlife by RGC personnel would be reduced by implementation of environmental protection measures RGC 10 (no firearms or pets for RGC employees and contractors while on the job), and RGC 11, training of employees and contractors regarding wildlife protections.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to antelope, because the activities would be short in duration and involve small numbers of employees.

Following abandonment and reclamation, conditions in the Project Area would tend to return to pre-project conditions. Recovery of wildlife populations would be limited to the extent that roads constructed or improved for the project were maintained after the end of the project. Collector, local, and resource roads that were improved from pre-project roads would be expected to be kept.

Moose

Construction. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 356 acres in moose limited value winter range (1.8 percent of this habitat within the Project Area) (Table 4.7-11). Construction would be spread over 6 to 10 years, but most of the impacts to moose habitat would occur in 1 to 3 construction years; during other years, construction would be occurring in other portions of the Project Area. Avoidance of streams and associated riparian areas (environmental protection measure BLM 4) would reduce potential impacts.

Indirect (displacement) effects of construction on moose would likely be minor, because little construction would occur during winter. Increases in mortality from collisions and increased legal and illegal hunting would also likely be minor during construction, because few moose would be present in the Project Area during the seasonal construction window.

Operation. The operational period would last about 20 years for any one well. During this period, the facilities in place would continue to occupy moose limited value winter habitat. The project-long total of areas occupied by operational facilities would be 213 acres in moose habitat (1.1 percent of available habitat in the Project Area).

Wintering moose may be subject to disturbance, stress, and displacement where wintering habitats overlap with project facilities. At full operation (years 10 to 20), 41 production wells, one injection well, one evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 30 miles of new or upgraded roads to

CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 15,751 acres (78 percent of available habitat in the Project Area) (Table 4.7-12). With winter road closure, the area of reduced habitat value would be reduced to 12,209 acres (60 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Minor amounts of increased mortality may occur, from collisions, illegal and legal hunting, and harassment.

Abandonment and Reclamation. Activities associated with abandonment would be likely to have minor direct and indirect impacts to moose, because the activities would be short in duration, involve small numbers of employees, and occur during the summer time when moose are mostly at higher elevations and are not under stress.

Raptors

Construction. Twenty-eight raptor nests are known to have been active in the Project Area from 1993 to 1995. Thirteen of these are within one-half mile of proposed facilities, including 9 golden eagle nests, 2 hawk (buteo) nests, 1 Cooper's hawk nest, and 1 historic golden eagle nest used by prairie falcons during 1993-1995. Twenty-two proposed wells would be within one-half mile of a recently active raptor nest, including 16 on federal lands, 4 on UDWR land, and 2 on state land. About 12 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 9.5 miles on federal land and 1.5 on UDWR land.

The 16 wells on BLM land would be subject to environmental protection measure BLM 40, which would restrict development of those wells. These wells could be developed if raptor nests were not used for a period of three years, which would indicate that the nests had been abandoned. This analysis represents wells and roads subject to restrictions based on current conditions (1993 to 1995 activity), and the locations and number of restricted wells would be likely to vary by the time of construction. The roads on BLM land and the wells and transportation corridors on other lands would be subject to seasonal restrictions on construction, which would delay construction until after nesting. Therefore, no direct or indirect disturbance would be likely from activities on federal lands for these nests during the year of construction. Some pairs could potentially be displaced in the following year, because of the presence of new facilities and the human activity associated with them. Nine of the raptor

nests would be protected by BLM environmental protection measures, but four of them may be affected by facilities on non-federal lands.

Operation. Application of environmental protection measures BLM 40 and BLM 41 would prevent adverse impacts to raptor nests on federal lands. Wells or facilities with recurring human activity on nonfederal land constructed in close proximity to raptor nests could result in mortality of young in the nest, reduced survival of young, and/or abandonment of the nesting territory during the operation phase. Nesting pairs of raptors displaced from their preferred nest sites may relocate to another nest site or construct new nests within the Project Area. Since suitable nesting habitat supporting a sufficient prey base to sustain nesting raptors may be occupied or limited in availability, displaced pairs may experience reduced productivity or nesting success. Some individuals may adapt to gas field activities, and re-occupy old nests or build new nests near CBM project facilities. Raptors may be subject to increased stress, disturbance and harassment from general increases in human activity resulting from the improved and expanded road system and well maintenance and operation. Harassment by RGC employees and contractors would be reduced with implementation of a wildlife protection training program (environmental protection measure RGC 11).

Abandonment and Reclamation. Activities associated with this phase would have minimal impacts on raptors. Raptors may continue to be subject to increased stress and harassment, compared to pre-project conditions, depending on how much of the road system were maintained by landowners after abandonment.

Sage Grouse

Aerial surveys over all potential sage grouse habitat within the Price CBM Project Area (i.e., Porphyry, Consumers, Horse and Telephone Benches) revealed no sign of sage grouse or sage grouse strutting grounds (MDG 1995a). Subsequent consultation with BLM (Mills 1995) and UDWR (Bates 1994) biologists determined that Porphyry, Consumers, Horse and Telephone Benches would be considered clear from current activity of breeding sage grouse and sage grouse strutting grounds. However, historic lek sites have been documented on Telephone Bench and may occur elsewhere in the Project Area.

Under current conditions, no adverse impacts to sage grouse strutting grounds or nesting habitat would occur from the Proposed Action. However, the presence of CBM facilities and human activity could prevent or delay re-establishment of sage grouse in the Project Area, if regional populations increase. The Proposed Action would not provide any large blocks of habitat suitable for reintroduction. It would directly affect 1,038 acres of yearlong habitat during construction, and 586 acres during operation (Table 4.7-14). This represents about 3.3 and 1.9 percent, respectively, of the sage grouse yearlong habitat in the Project Area.

Other Upland Game

Chukar, ring-necked pheasant and desert cottontail may experience increased mortality during construction and operation, from increased vehicle traffic. Because of their high reproductive rates, this is unlikely to have any effect on populations in the Project Area. All three species are mobile, and unlikely to be killed or injured by other construction activity. They are relatively tolerant of human activity,

and are unlikely to suffer displacement from facilities after construction if surrounding habitat remains suitable. Long-term losses of habitat and carrying capacity would occur where roads, well pads, and other facilities occupy their habitats. Losses of habitat value and populations were assumed to be proportional to the area directly disturbed within the vegetation types representing their general habitat:

- I. Chukar occur primarily in sagebrush, salt desert, and riparian habitats, which occupy about 72 percent of the study area. Under the proposed Action, well field facilities will occupy about 1,927 acres, or about 1.4 percent of chukar habitat.
- II. Pheasants occur mainly in agricultural and riparian areas, which together cover about 20,687 acres, or about 11 percent of the Project Area. Well field facilities would occupy about 187 acres in pheasant habitat, or about 0.9 percent of available habitat.
- III. Desert cottontail rabbits occur in all habitat types. Well field facilities would occupy about 2,353 acres, or 1.2 percent of their habitat, for the life of the project.

White-tailed Prairie Dog Complexes

Approximately 7,094 acres of white-tailed prairie dog complexes occur within the Price River CBM Project Area. Numerous federal and state threatened, endangered and sensitive species are grassland/shrubland ecosystems species, particularly associated with the presence of prairie dogs. The white-tailed prairie dog complexes in the Price area provide potential prey and year-long habitat for the endangered black-footed ferret, nesting habitat for burrowing owls, and prey for ferruginous hawks. Disturbance during road and well construction phases would directly disturb or destroy individual prairie dog mounds. There would likely be increased direct mortality from construction activities, increased numbers of vehicles, and from indiscriminate shooting by the public. These are unlikely to have a long-term adverse effect on prairie dog populations.

The Proposed Action would affect 244 acres of active prairie dog towns, of which 130 acres would be occupied by facilities such as roads and well pads (Table 4.7-15). This would be a loss of about 1.9 percent of current prairie dog habitat, for the life of the project. Prairie dog towns in the Project Area have an average of about 66 burrows per acre, based on transects conducted in 1994 (Intermountain Ecosystems 1994). Construction would destroy or disturb about 16,100 burrows in active prairie dog towns, of which about 8600 would be in areas occupied by roads or wellpads. Prairie dog populations fluctuate, and the proportion of burrows and size of complexes will also vary. In 1994, about 45 percent of the burrows were occupied in the active prairie dog complexes in the Project Area, based on data in

Intermountain Ecosystems (1994).

Waterfowl and Shorebirds

Under the Proposed Action, construction of 7 new evaporation ponds would result in an additional 24 acres of surface water habitat, in addition to the 11.5 acres of surface water at the existing evaporation pond which began operating in 1996. These new areas of surface water are likely to attract waterfowl and shorebirds, particularly during migration, and would greatly expand the amount of surface water available in the Project Area.

The new evaporation ponds would be similar to the existing RGC evaporation pond, except for size (approximately 3.7 surface acres each, compared to 11.5). The existing pond began operation in August of 1996, and is a pilot test for operation of the other ponds. It is lined and fenced, and the berms around it are kept clear of vegetation. A spray evaporation system is being used approximately 9 months of the year to accelerate evaporation. Evaporation would eliminate some of the produced water entering the ponds, and the remainder would be pumped from the deeper end of the pond, opposite the inlet, and disposed in injection wells. Pond operations are still being tested; for planning purposes RGC has estimated that water would be removed from the pond when it has a concentration of about 15,000 mg/L TDS. The spray evaporation system would become less effective as TDS concentrations increase. On November 18, 1996, the concentration of the pond surface water was 11,755 mg/L, and the pond bottom was 14,546 mg/L. Disposal into the injection well had not yet begun at that time. Produced water entering the pond has 6,500 to 9,000 mg/L TDS. Salts present in the produced water are mainly sodium bicarbonate and sodium chloride. (Refer to Table 4.2-2 for

water quality results of evaporation pond water.)

Phytoplankton and aquatic invertebrates are expected to become established in the ponds within the first several years of operation, and to become a food source for waterfowl and shorebirds. Birds are most likely to occur during migration, or other non-breeding periods. Little or no waterfowl breeding is expected, because of the absence of vegetation within the fenced perimeter of the pond.

If breeding were to occur, the salinity of the evaporation ponds would be high enough to cause reduced growth, other sublethal effects, or increased mortality of ducklings. Ducklings may experience adverse effects at about 7,000 mg/L TDS, and mortality at about 17,000 mg/L. Waterfowl have salt glands in their nostrils that enable them to dispose of excess salts, which become functional with age and length of exposure to elevated salt levels. Recently hatched ducklings require fresh water for survival because their salt glands do not work for the first six days (Swanson et al, 1988). In North Dakota, wild ducklings on saline lakes concentrated and fed around freshwater seepages, and saline lakes presented major limitations for waterfowl breeding.

Birds with flight capability are not reported to be adversely affected by saline lakes under natural conditions. In North Dakota, waterfowl have been observed to congregate at saline lakes when large numbers of invertebrates are present (Swanson et al, 1988). Birds feeding on saline lakes may fly to other sources for freshwater, and adult waterfowl are relatively tolerant to salinity. Adult mallards can tolerate water containing about 20,000 mg/L sodium chloride, but cannot survive on seawater (Mitchell and Wobeser 1988). The salinity of the evaporation ponds is therefore not likely to

cause mortality to waterfowl.

Salt loading of feathers has been reported in both natural salt lakes and at evaporation ponds, resulting in salt toxicosis or secondary mortality. Wobeser and Howard (1987) reported mortality as a result of crystallization of salt on the plumage of waterfowl at a hypersaline lake in Saskatchewan, where water became supersaturated when cooled. Euliss, Jarvis and Gilmer (1989) found carbonate deposition on tail feathers of ruddy ducks, which caused erosion of the tail feather vanes and difficulty in flying. This occurred at an evaporation pond with a conductivity up to 6 times that of sea water. These reported cases have occurred on hypersaline waters (water more saline than sea water). Water in the evaporation ponds in the Project Area would have much lower salinities, and salt loading of feathers is not expected to be a problem.

The produced water does not have any other constituents in potentially toxic quantities, except possibly for boron. Sampling of the pond on March 27, 1996, found that arsenic, cadmium, chromium, copper, lead, and selenium concentrations were below Utah water quality numeric standards for Class 3D waters (protected for waterfowl, shore birds, and other water-oriented wildlife, including the necessary aquatic organisms in their food chain). Somewhat higher concentrations may occur during operation, but periodic removal and injection of pond water would prevent high concentrations from accumulating.

Boron is not addressed by a Utah water quality standard for wildlife, but concentrations in the evaporation pond of 7.0 to 7.4 mg/L exceed the Utah agricultural standard of 0.7 mg/L by a factor of ten. Agricultural crops are relatively sensitive to boron, with effects reported at concentrations as low as 0.3 to 1.25 mg/L in

irrigation water, for sensitive species (Eisler 1990). Aquatic organisms, including plants, invertebrates, fish and amphibians are reported to tolerate up to 10 mg/L for extended periods without harm, but 1 mg/L is recommended as a standard for aquatic life (Eisler 1990). For waterfowl, growth is adversely affected at a dose of 30 mg/kg body weight, with no adverse effects at 13 mg/kg body weight. These are equivalent to a dietary concentration of 150 mg/L and 65 mg/L, respectively. Much larger concentrations are required to cause lethal effects. Based on these data, boron may limit growth of some aquatic organisms, but is not likely to adversely affect waterfowl at the concentrations reported.

Song Birds

Impacts to non-game birds resulting from the Proposed Action would consist of direct mortality from increased human activity and traffic, and habitat loss. Indirect impacts would consist of displacement from nesting habitat. Short-term direct loss of individuals and nest sites would occur in all habitat types during any construction activities occurring during the breeding season. Long-term loss of habitat and displacement of birds from breeding habitat would also occur in areas with semi-permanent wells, roads and facilities, and high human activity. About 2.2 percent of the general song bird habitat in the project area would be destroyed or altered during construction and operation (Table 4.5-1), and would result in a proportionate decrease in bird populations. About 1.2 percent eliminated during the operational phase of the project, in areas occupied by wellpads, roads, and other aboveground facilities, resulting in a long-term reduction in carrying capacity. An additional 1.0 percent of the Project Area would be disturbed during the construction period. Although areas of short-term impacts would be revegetated, their value for song birds would be reduced for 10 to 15 years until shrubs are re-established and approximately their original size.

Reptiles and Amphibians

Ground-disturbing activities such as road and wellpad construction would displace, kill or injure reptiles and amphibians in the construction zone, and increased roads and road traffic would caused increased mortality during both construction and operation. Areas occupied by aboveground facilities would mostly become non-habitat for the life of the project, while areas affected short-term during construction of pipelines and underground transmission lines may have a reduced carrying capacity for several years until vegetation re-establishes. Reptiles occur in all of the vegetation types, while amphibians are most likely to occur in riparian and agricultural areas, and in the vicinity of streams and springs. About 2.2 percent of the general habitat in the Project Area would be affected during construction and operation (Table 4.5-1), including about 1.2 percent eliminated during the operational phase of the project, and an additional 1.0 percent disturbed during the construction period. Impacts to reptile and amphibian populations in the Project Area are anticipated to be minor.

4.7.2.2 Alternative A

Impacts under Alternative A would be similar to those described for the Proposed Action; however, the magnitude of the impacts under Alternative A would be greater than the Proposed Action because of the increased number and density of wells and roads. The analysis below only describes differences between Alternative A and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the increased well density and number of facilities.

Direct impacts on habitat from construction would be increased by 37 percent (to 1,834 acres) for critical winter habitat and by 27 percent (to 1,508 acres) for high value winter habitat (Table 4.7-1). About 1,206 acres (66 percent) of the construction impacts in critical winter habitat and 904 acres (60 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (628 acres of critical winter range and 604 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.2 percent of the winter range in the herd unit and are considered significant.

Areas occupied by operational facilities would increase by 51 percent in critical winter range (to 1,142 acres), and by 31 percent in high value winter range (to 943 acres). At full operation (years 10 to 20), 357 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 265 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 147 miles of roads servicing gas field facilities in critical winter habitat, and 129 miles of roads in high value

winter habitat.

The area of indirect impact from displacement would be 22,162 acres in critical winter habitat (41 percent of that type in the Project Area), and 18,682 acres (36 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 13,027 acres in critical winter range (24 percent of available habitat in the Project Area), and 13,368 acres in high value winter range (26 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be greater than would the Proposed Action, because of the larger road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 24 percent of winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 3,220 deer, and a reduction in the target buck harvest of 332 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the increased well density and number of facilities.

Direct impacts of construction would be increased by 25 percent (to 1,020 acres) for critical winter habitat and by 33 percent (to 2,196 acres) for high value winter habitat (Table 4.7-4). About 479 acres (47 percent) of the construction impacts to critical winter habitat and 1,527 acres (70 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (541 acres of critical winter range and 669 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 1.2 percent of the winter range in the Project Area.

Areas occupied by operational facilities would increase by 32 percent in critical winter range (to 620 acres), and by 45 percent in high value winter range (to 1,381 acres). At full operation, 183 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 413 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 84 miles of roads servicing gas field facilities in critical winter habitat, and 182 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 26,425 acres in critical winter habitat (87 percent of that type in the Project Area), and 54,352 acres (80 percent) in high value

winter range). Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 10,828 acres in critical winter range (36 percent of available habitat in the Project Area), and 38,502 acres of in high value winter range (57 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be greater than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 11 percent of winter range carrying capacity in the Manti herd unit would lead to a reduction in the target herd size of 1,210 elk, and a reduction in the target bull harvest of 143 bulls (Table 4.7-6).

Black Bear

With Alternative A, the types of impacts would be the same as for the Proposed Action. The area of affect for direct impacts would be increased, but the area of indirect impacts would be about the same (Tables 4.7-7 and 4.7-8). The area of construction impacts would be increased about 19 percent to 673 acres, and the area of operational facilities increased about 23 percent to 408 acres. Construction would occur during summer and early fall months, when black bears are active, and black bears would likely be displaced during construction and operation of the facilities. At an estimated displacement distance of 800 meters, bear would be displaced from 22,351 acres, 84 percent of their habitat in the Project Area. At full operation (years 10 to 20), 114 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 55 miles of roads to CBM field facilities within black bear habitat. Black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative A would be similar to those described for the Proposed Action. A larger area would be directly affected, as described for mule deer. Although there would be an increased density of wells and roads, the area of displacement would be about the same as with the Proposed Action. Mountain lion could be displaced from about 80 percent (84,200 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 1.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of the greater density of wells and roads. The analysis below only describes differences between Alternative A and the Proposed Action.

Direct impacts from construction would be increased by 46 percent (to 1,276 acres) within antelope high value yearlong habitat (2.6 percent of habitat available in the Project Area), and by 67 percent to 1,084 acres of potential antelope habitat (3.7 percent) (Table 4.7-9). Based on a displacement distance of 100 meters, antelope would be displaced from 8,284 acres of high value yearlong habitat during construction (16.9 percent of that available in the Project Area) (Table 4.7-10). Although antelope do not currently occur west of Highway 10, noise and disturbance would make 6,741 acres (13.9 percent) of potential habitat unsuitable for future occupancy.

The area occupied by operational facilities would also increase substantially, to 802 acres

in high value yearlong habitat, and 655 acres in potential yearlong habitat. Displacement effects would continue during operation, although some habituation may occur which would reduce the area of effect. At full operation (years 10 to 20), 273 production wells and 104 miles of new or improved roads would be located in high value winter habitat. Direct disturbance of vegetation and displacement effects may limit expansion of antelope populations into the potential habitat west of Highway 10; project facilities planned for that area include 200 wells, 3 evaporation ponds, 3 injection wells, 1 compressor station, and 83 miles of new or improved roads, along with 79 existing wells. Although displacement effects would likely result in decreased use of the Project Area by antelope, they would be unlikely to have significant adverse effects on overall antelope populations even at full development, because less than 1 percent of habitat available within the herd unit would be affected, and no critical habitat would be affected. Some increases in hunting and harassment would be likely to occur, and may also reduce the number of antelope in the Project Area.

Moose

The types and magnitude of impacts to moose would be about the same as for the Proposed Action (Tables 4.7-11 and 4.7-12). Direct impacts would be slightly greater due to the increased well density, and there would be more facilities (wells and roads) located in moose habitat, but the area of indirect impacts would be the same. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 407 acres in moose limited value winter range (2.0 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 250 acres in moose habitat (1.2 percent of available habitat in the Project Area). At full operation (years 10 to 20), 63 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 34 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 15,771 acres (78 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 12,199 acres (60 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative A, two additional raptor nests would be within one-half mile of project facilities than with the Proposed Action.

The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Fifteen raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 10 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 2 historic golden eagle nest used by prairie falcons during 1993-1995. Forty-two new wells would be within one-half mile of a recently active raptor nest, including 26 on federal lands, 7 on UDWR land, 5 on state land, and 4 on private land. About 19 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 12 miles on federal land and 2 on UDWR land. Eight of the raptor nests would be protected by BLM environmental protection measures, but seven of them may be affected by facilities on non-federal lands.

Sage Grouse

Like the Proposed Action, Alternative A would not provide any large blocks of habitat suitable for reintroduction. It would directly affect a larger area of yearlong habitat, 1,302 acres during construction, and 807 acres during operation (Table 4.7-14). This represents 4.1 and 2.6 percent, respectively, of the sage grouse yearlong habitat in the Project Area (Table 4.7-14).

Other Upland Game

Alternative A would have impacts similar to the Proposed Action, but would have more habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 2,946 acres, or about 2.2 percent of general chukar habitat.
- II. Ring-necked pheasant: about 284 acres, or

about 1.4 percent of general pheasant habitat.

Desert cottontail: about 3,585 acres, or 1.9 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, but a greater area of prairie dog complexes would be affected. Alternative A would impact 382 acres of prairie dog towns, of which 225 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 3.2 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 25,200 burrows, of which about 14,850 would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds and reptiles and amphibians would be the same as for the Proposed Action, but a larger area of habitat would be affected. About 3.1 percent of the general habitat in the Project Area would be affected during construction and operation, including about 1.9 percent eliminated during the operational phase of the project and an additional 1.2 percent in areas of short-term disturbance.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface

water habitat created would be increased to about 27 acres.

4.7.2.3 Alternative B1

Alternative B1 would preclude CBM well development in the federal mineral estate within the combined deer and elk critical winter range under the 160 acre well spacing scenario (Section 2.4.1).

Impacts under Alternative B1 would be similar to those described for the Proposed Action. However, the magnitude of the impacts under this alternative would be reduced from the Proposed Action because of the decreased number and density of wells. The magnitude of potential adverse impacts would generally decrease in proportion to the decrease in well density and miles of transportation corridor. The location of facilities would also be modified because development would be restricted in a large area west of Price, which would further reduce impacts for some species, and would also provide suitable locations for compensatory habitat enhancement projects. The analysis below only describes differences between Alternative B1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development, a substantial area of effect would still occur because of transportation corridors through federal lands and CBM project development on BLM high value winter habitat, and in critical and high value habitat on state, UDWR, and private lands.

Direct impacts on habitat from construction would be decreased by 60 percent (to 536 acres) for critical winter habitat and by 12 percent (to 1,051 acres) for high value winter

habitat (Table 4.7-1). About 131 acres (24 percent) of the construction impacts in critical winter habitat and 581 acres (55 percent) in high value habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (405 acres of critical winter range and 470 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 62 percent in critical winter range (to 288 acres), and by 11.5 percent in high value winter range (to 630 acres). At full operation (years 10 to 20), 78 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in critical winter range; and 146 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 41 miles of roads servicing gas field facilities in critical winter habitat, and 94 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 6,585 acres in critical winter habitat (12 percent of that type in the Project Area), and 13,988 acres (27 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 4,680 acres in critical winter range (9 percent of available habitat in the Project Area), and 10,590 acres in high value winter range (20 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the smaller road network and avoidance of much of

the critical winter habitat.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 8 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,120 deer, and a reduction in the target buck harvest of 112 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development, a substantial area of effect would still occur, because of development in other areas and from transportation corridors on federal lands.

Direct impacts on habitat from construction would be decreased by 33 percent (to 539 acres) for critical winter habitat and by 41 percent (to 974 acres) for high value winter habitat (Table 4.7-4). About 151 acres (28 percent) of the construction impacts in critical winter range and 496 acres (51 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (388 acres of critical winter range and 478 acres of high value

winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 0.9 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 35 percent in critical winter range (to 311 acres), and by 40 percent in high value winter range (to 565 acres). At full operation, 68 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 125 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 44 miles of roads servicing gas field facilities in critical winter habitat, and 84 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 20,050 acres in critical winter habitat (66 percent of that type in the Project Area), and 35,859 acres (53 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,662 acres in critical winter range (32 percent of available habitat in the Project Area), and 29,288 acres in high value winter range (43 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be much less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying

capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative B1, the types of impacts would be the same as for the Proposed Action, but the area of effect would be greatly reduced (Tables 4.7-7 and 4.7-8). About two-thirds of bear habitat in the Project Area would be located within the critical area where development on BLM lands would be restricted. The area of construction impacts would be decreased about 24 percent to 430 acres, and the area of operational facilities decreased about 25 percent to 248 acres. The area of indirect impacts would be reduced about 21 percent, to 17,704 acres (67 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 53 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 35 miles of roads to CBM field facilities within black bear habitat. With two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative B1 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within critical elk and deer winter range, which would provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from about 56 percent (59,000 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 3. In addition, a smaller area would be directly affected, as described for mule deer.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. In addition, the area of direct and indirect impacts would be almost identical to the Proposed Action (Tables 4.7-9 and 4.7-10). The restrictions on development in the mule deer and elk critical habitat would have almost no effect on development in pronghorn habitat.

Moose

The types of impacts to moose for Alternative B1 would be the same as for the Proposed Action, but the area affected would be reduced in size by about 8 to 15 percent (Tables 4.7-11 and 4.7-12). The critical area addressed in this alternative covers about half of the moose winter habitat. Construction of the wellpads, roads, pipelines, and other facilities would involve disturbance or removal of existing vegetation on 297 acres in moose limited value winter range (1.5 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 176 acres in moose habitat (0.9 percent of available habitat in the Project Area). At full operation (years 10 to 20), 30 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 25 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 13,619 acres (67.7 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 11,143 acres (55 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative B1, most of the BLM lands in the northwest quarter of the Project Area would be restricted from development. Since most active raptor nests are in this area, this alternative would have much lower conflicts with raptors than the Proposed Action. Only four raptor nests would be within one-half mile of project facilities, compared to 13 for the Proposed Action, and a relatively small number of wells and roads would be located within buffer zones of recently active raptor nests. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Four raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 2 golden eagle nests, 1 buteo nest, and 1 Copper's hawk nest. Seven new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 4 on UDWR land, and 2 on state land. About 3 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 1 mile on federal land and 1.5 miles on UDWR land. All four active raptor nests may be affected by facilities on non-federal lands.

Sage Grouse

This alternative would provide some areas suitable for sage grouse reintroduction. There would be no wells on Horse Bench, and the number of wells on Cedar Bench would be reduced from 5 to 2. It would also have reduced direct effects on sage grouse yearlong habitat, 611 acres (1.9 percent) during construction and 355 (1.1 percent) during operation (Table 4.7-14).

Other Upland Game

Alternative B1 would have impacts similar to the Proposed Action, but would have less habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 1,547 acres, or about 1.1 percent of general chukar habitat.
- II. Ring-necked pheasant: about 186 acres, or about 0.9 percent of general pheasant habitat.
- III. Desert cottontail: about 1,818 acres, or 1.0 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, and a similar area of prairie dog complexes would be affected. Alternative B1 would impact 244 acres of prairie dog towns, of which 133 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 1.9 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 16,100 burrows, of which about 8800 would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds and reptiles and amphibians would be the same as for the Proposed Action, but a smaller area of habitat would be affected. About 1.7 percent of the general habitat in the Project Area would be affected during construction and operation, including about 1.0 percent eliminated during the operational phase of the project.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be less, about 17 acres.

4.7.2.4 Alternative B2

Alternative B2 would preclude CBM well development in the federal mineral estate within the combined deer and elk critical winter range under the 80 acre well spacing scenario (Section 2.4.2).

Impacts under Alternative B2 would be similar to those described for the Proposed Action. The magnitude of the impacts under this alternative would be variously greater or less than the Proposed Action depending on the distribution of animal habitats relative to the areas closed to development. This alternative would provide suitable locations for compensatory habitat improvement projects. The analysis below only describes differences between Alternative B1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on federal land would be restricted from development a substantial area of effect would still occur because of transportation corridors through critical winter habitat on federal lands, and CBM project development on BLM high value winter habitat, and in critical and high value habitat on state, UDWR, and private lands. In addition, the density of wells would increase.

Direct impacts on habitat from construction would be decreased by 44 percent (to 758 acres) for critical winter habitat and would be increased by 13 percent (to 1,346 acres) for high value winter habitat (Table 4.7-1). About 164 acres (22 percent) of the construction impacts in critical winter habitat and 768 acres (57 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (594 acres of critical winter range and 578 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.1 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 42 percent in critical winter range (to 439 acres), and would increase by 18 percent in high value winter range (to 840 acres). At full operation (years 10 to 20), 119 production wells, 2 injection wells, 2 evaporation

ponds, and one compressor station would be located in critical winter range; and 230 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 58 miles of roads servicing gas field facilities in critical winter habitat, and 114 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 9,034 acres in critical winter habitat (17 percent of that type in the Project Area), and 16,697 acres (32 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 6,204 acres in critical winter range (12 percent of available habitat in the Project Area), and 12,780 acres in high value winter range (25 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the smaller road network and avoidance of much of the critical winter habitat.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 11 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,540 deer, and a reduction in the target buck harvest of 154 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Although deer and elk critical winter habitat on BLM land would be restricted from development, a substantial area of effect would still occur because of development in other areas, and because the density of wells and other facilities would increase.

Direct impacts on habitat from construction would be decreased by 13 percent (to 706 acres) for critical winter habitat and by 23 percent (to 1,274 acres) for high value winter habitat (Table 4.7-4). About 191 acres (27 percent) of the construction impacts in critical winter range and 641 acres (50 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (515 acres of critical winter range and 633 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 1.2 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 9 percent in critical winter range (to 431 acres), and by 19 percent in high value winter range (to 771 acres). At full operation, 115 production wells, 2 injection wells, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 211 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 55 miles of roads servicing gas field facilities in critical winter habitat, and 107 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 21,028 acres in critical winter habitat (69 percent of that type in the Project Area), and 39,653 acres (58 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 10,087 acres in critical winter range (33 percent of available habitat in the Project Area), and 31,370 acres of reduced habitat value in high value winter range (46 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative B2, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced (Tables 4.7-7 and 4.7-8). About two-thirds of bear habitat in the Project Area would be located within the critical area where development on BLM lands would be restricted, but there would be an increased density of wells on non-BLM lands within black bear habitat. The area of construction impacts would be decreased about 9 percent to 514 acres, and the area of operational facilities decreased about 7 percent to 308 acres. The area of indirect impacts would be reduced about 17 percent, to 18,544 acres (70 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 79 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 41 miles of roads to CBM field facilities within black bear habitat. With 70 percent of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to regional black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative B2 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within critical elk and deer winter range, which would provide secure areas for mountain lions and help to maintain them in the Project Area. There would be an increased density of wells and roads outside of these areas. Mountain lion could be displaced from 61 percent (64,100 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar under Alternative B2 compared to the Proposed Action. The magnitude of direct and indirect impact would be greater because the increased density of wells and facilities, and would be almost identical to Alternative A. Restrictions on development on BLM lands within critical and high value mule deer and elk winter range would have almost no effects in pronghorn antelope habitat.

Moose

The types of impacts and area of direct impact would be about the same with this Alternative as for the Proposed Action; but the area of indirect impact would be reduced about 6 percent (Tables 4.7-11 and 4.7-12). As with Alternative B1, the critical area addressed in this alternative covers about half of the moose winter habitat. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 348 acres in moose limited value winter range (1.7 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 212 acres in moose habitat (1.0 percent of available habitat in the Project Area). At full operation (years 10 to 20), 48 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 29 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 14,073 acres (70 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 11,351 acres (56 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative B2, most of the BLM lands in the northwest quarter of the Project Area would again be restricted from development. Since most active raptor nests are in this area, this alternative would have lower conflicts with raptors than the Proposed Action on BLM land. For other lands the full buildout would result in more conflicts than the Proposed Action. Conflicts would be centered around only 8 recently active raptor nests, compared to 13 for the Proposed Action. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Eight raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 6 golden eagle nests, 1 buteo nests, and 1 Cooper's hawk nest. Seventeen new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 7 on UDWR land, 6 on state land, and 3 on private land. About 4.5 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 1 mile on federal land and 2 miles on UDWR land. All eight nests may be affected by facilities on non-federal lands.

Sage Grouse

This alternative would be similar to Alternative B1, and would provide some areas suitable for sage grouse reintroduction. There would be no wells on Horse Bench, and only 2 on Cedar Bench. It would have greater direct effects to sage grouse yearlong habitat than Alternative B1, because of the increased well and road density. It would affect 781 acres (2.5 percent) during construction, and 477 acres (1.5 percent) during operation (Table 4.7-14).

Other Upland Game

Alternative B2 would have impacts similar to the Proposed Action, but would have more habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 2,365 acres, or about 1.8 percent of general chukar habitat.
- II. Ring-necked pheasant: about 284 acres, or about 1.4 percent of general pheasant habitat.
- I. Desert cottontail: about 2,775 acres, or about 1.5 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, but a greater area of prairie dog complexes would be affected, similar to Alternative A. Alternative B2 would impact 373 acres of prairie dog towns, of which 221 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 3.2 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 24,600 burrows, of which about 14,600 would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds, reptiles and amphibians would be the same as for the Proposed Action, but a larger area of habitat would be affected. About 2.4 percent of the general habitat in the Project Area would be affected

during construction and operation, including about 1.5 percent eliminated during the operational phase of the project, and about 0.9 percent affected by short-term disturbance.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be the same, about 24 acres.

4.7.2.5 Alternative C1

This alternative would preclude CBM development on specific portions of the elk and mule deer winter habitat identified as security areas. These areas were developed jointly by UDWR and BLM based on past experience with big game winter distribution patterns, and represent the most valuable winter habitats. Outside of these areas, which occupy 5 percent or less of the total Project Area, development would be the same as with the Proposed Action.

Impacts from this alternative would be similar to those described for the Proposed Action, except for reductions in magnitude and locations of disturbance associated with the security areas. Since most of the Security Areas are directly associated with the major drainages (i.e., Gordon Creek) that serve as primary big game migration routes, protection of these areas would minimize interference with big game movement between seasonal ranges. Another difference between this alternative and the proposed action is that protecting the Security areas from any type of disturbing activity would make these areas suitable for enhancement work designed as mitigation. The analysis below

only describes differences between Alternative C1 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of restrictions on development in the security areas, which includes concentration areas within critical and high value winter range.

Direct impacts on habitat from construction would be decreased by 16 percent (to 1,132 acres) for critical winter habitat and would be decreased by 9 percent (to 1,085 acres) for high value winter habitat (Table 4.7-1). About 709 acres (63 percent) of the construction impacts in critical winter habitat and 630 acres (58 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (423 acres of critical winter range and 455 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 16 percent in critical winter range (to 636 acres), and would decrease by 9 percent in high value winter range (to 649 acres). At full operation (years 10 to 20), 168 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 147 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 93 miles of roads servicing gas field facilities in

critical winter habitat, and 97 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 14,505 acres in critical winter habitat (27 percent of that type in the Project Area), and 14,405 acres (28 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,116 acres in critical winter range (17 percent of available habitat in the Project Area), and 10,624 acres in high value winter range (21 percent) (Table 4.7-2). This analysis may be conservative (overestimating impacts) because no allowance has been made for the greater value of the security areas as wintering habitat, relative to other winter range. Increases in mortality from vehicle collisions and legal and illegal hunting would be smaller than with the Proposed Action, because of the reduced development.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 16 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 2,240 deer, and a reduction in the target buck harvest of 224 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of restrictions on development in security areas, which includes concentration areas within elk critical and high value winter habitat.

Direct impacts on habitat from construction would be decreased by 24 percent (to 618 acres) for critical winter habitat and by 8 percent (to 1,524 acres) for high value winter habitat (Table 4.7-4). About 237 acres (38 percent) of the construction impacts in critical winter range and 1,037 acres (68 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (381 acres of critical winter range and 487 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 0.9 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 24 percent in critical winter range (to 362 acres), and by 7 percent in high value winter range (to 882 acres). At full operation, 84 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 219 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 50 miles of roads servicing gas field

facilities in critical winter habitat, and 132 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 20,856 acres in critical winter habitat (69 percent of that type in the Project Area), and 51,278 acres (76 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,369 in critical winter range (31 percent of available habitat in the Project Area), and 38,295 acres in high value winter range (57 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 9 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 990 elk, and a reduction in the target harvest of 117 bulls (Table 4.7-6).

Black Bear

With Alternative C1, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be greatly reduced and would be similar to Alternative B1 (Tables 4.7-7 and 4.7-8). About one-quarter of bear habitat in the Project Area would be located within several security areas where development on BLM and UDWR lands would be restricted. The area of construction impacts would be decreased about 24 percent to 428 acres, and the area of operational facilities decreased about 24 percent to 250 acres. The area of indirect impacts would be reduced about 22 percent, to 17,396 acres (65 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 59 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 34 miles of roads to CBM field facilities within black bear habitat. With nearly two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative C1 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within elk and deer security areas. These would also provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from about 71 percent (75,300 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

With Alternative C1, the types and magnitude of impacts to pronghorn antelope would be the same as the Proposed Action. None of the areas closed to development is antelope habitat.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be less because several of the security areas are located in moose winter habitat. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance or removal of existing vegetation on 259 acres in moose limited value winter range (1.3 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 156 acres in moose habitat (0.8 percent of available habitat in the Project Area). At full operation, 32 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 21 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 12,068 acres (59.7 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 9,794 acres (48 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative C1, a number of big game security areas would be restricted from development, mainly in the northwest quarter of the Project Area. Several of the active raptor nests are in these areas, and this alternative would have somewhat lower conflicts with raptors than the Proposed Action. Eleven raptor nests would be affected, compared to 13 for the Proposed Action, and the number of wells within buffer zones would be reduced from 24 to 17. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Eleven raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 7 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 1 historic golden eagle nest used by prairie falcons 1993-1995. Sixteen new wells would be within one-half mile of a recently active raptor nest, including 9 on federal lands, 5 on UDWR land, and 2 on state land. About 7 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 5 miles on federal land and 1 mile on UDWR land. Seven of the 11 nests would be protected by BLM environmental protection resources, but four of them may be affected by facilities on non-federal lands.

Sage Grouse

Alternative C1 would provide areas suitable for sage grouse reintroduction, because there would be no development on Telephone or Cedar Benches. It would have less direct impacts on yearlong habitat than the Proposed Action, and more than Alternative B1. It would affect 811 acres (about 2.6 percent) during construction, and 457 acres (about 1.5 percent) during operation (Table 4.7-14).

Other Upland Game

Alternative C1 would have impacts similar to the Proposed Action, but would have less habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 1,784 acres, or about 1.3 percent of general chukar habitat.
- II. Ring-necked pheasant: about 186 acres, or about 0.9 percent of general pheasant habitat.
- III. Desert cottontail: about 2,170 acres, or about 1.2 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, and the area affected would be the same. Alternative C1 would impact 244 acres of prairie dog towns, of which 130 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 1.9 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 16,100 burrows, of which about 8600 would be in areas occupied

by roads or wellpads.

Other Species

The types of impacts to songbirds, reptiles and amphibians would be the same as for the Proposed Action, but a smaller area of habitat would be affected. About 2.0 percent of the general habitat in the Project Area would be affected during construction and operation, including about 1.2 percent eliminated during the operational phase of the project and an additional 0.8 percent in areas of short-term disturbance.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be the same, about 24 acres.

4.7.2.6 Alternative C2

This alternative would preclude CBM development on specific portions of the elk and mule deer winter habitat identified as security areas. Outside of these areas, which occupy 5 percent or less of the total Project Area, development would be similar to Alternative A, with 80 acre well spacing.

Impacts from this alternative would be similar to those described for the Proposed Action, except for reductions in magnitude and locations of disturbance associated with the security areas, and increases associated with the denser well spacing and increased road network. The analysis below only describes differences between Alternative C2 and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be increased because of increased numbers of wells on areas outside the security areas.

Direct impacts on habitat from construction would be increased by 13 percent (to 1,510 acres) for critical winter habitat and by 17 percent (to 1,392 acres) for high value winter habitat (Table 4.7-1). About 955 acres (63 percent) of the construction impacts in critical winter habitat and 845 acres (61 percent in high value winter habitat) would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (555 acres of critical winter range and 547 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 1.0 percent of the winter range in the herd unit.

Areas occupied by operational facilities would increase by 24 percent in critical winter range (to 936 acres), and would increase by 22 percent in high value winter range (to 871 acres). At full operation (years 10 to 20), 288 production wells, 3 injection wells, 3 evaporation ponds, and one compressor station would be located in critical winter range; and 245 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 119 miles of roads servicing gas field facilities in critical winter habitat, and 118 miles of roads in

high value winter habitat.

The area of indirect impact from displacement would be 18,218 acres in critical winter habitat (34 percent of that type in the Project Area), and 17,203 acres (33 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 11,437 acres in critical winter range (21 percent of available habitat in the Project Area), and 12,880 acres in high value winter range (25 percent) (Table 4.7-2). This analysis may be conservative (overestimating impacts) because no allowance has been made for the greater value of the security areas as wintering habitat, relative to other winter range. Increases in mortality from vehicle collisions and legal and illegal hunting would be greater than with the Proposed Action, because of the increased road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 20 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 2,800 deer, and a reduction in the target buck harvest of 280 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased in critical winter habitat because of restrictions on development in security areas, but increased in high value winter habitat because of the greater well density.

Direct impacts on habitat from construction would be decreased by 3 percent (to 787 acres) for critical winter habitat and increased by 21 percent (to 1,890 acres) for high value winter habitat (Table 4.7-4). About 319 acres (41 percent) of the construction impacts in critical winter habitat and 1,374 acres (69 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (468 acres of critical winter range and 616 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent about 1.1 percent of the winter range in the Project Area.

Areas occupied by operational facilities would increase by 1 percent in critical winter range (to 482 acres), and by 31 percent in high value winter range (to 1,247 acres). At full operation, 140 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 366 production wells, 3 injection wells, 2 compressor stations and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 62 miles of roads servicing gas field facilities in critical winter habitat, and 164 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 21,232 acres in critical winter habitat (70 percent of that type in the Project Area), and increased slightly to 53,310 acres (79 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 9,590 acres in critical winter range (32 percent of available habitat in the Project Area), and 39,550 acres in high value winter range (58 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 10 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 1,100 elk, and a reduction in the target buck harvest of 130 bulls (Table 4.7-6).

Black Bear

With Alternative C2, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced, especially for indirect impacts (Tables 4.7-7 and 4.7-8). About one-quarter of bear habitat in the Project Area would be located within several security areas where development on BLM and UDWR lands would be restricted. The area of construction impacts would be decreased about 10 percent to 511 acres, and the area of operational facilities decreased about 6 percent to 310 acres. The area of indirect impacts would be reduced about 21 percent, to 17,646 acres (66 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 86 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 40 miles of roads to CBM field facilities within black bear habitat. With two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under Alternative C2 would be similar in type but reduced in scale from those described for the Proposed Action. Development would be restricted on federal lands within elk and deer security areas. These would also provide secure areas for mountain lions and help to maintain them in the Project Area. Mountain lion could be displaced from 74 percent (78,000 acres) of habitat, resulting in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

With Alternative C2, the types and magnitude of impacts to pronghorn antelope would be the same as Alternative A. Compared to the Proposed Action, the magnitude of impact would be greater because the increased density of wells and area of direct and indirect effect.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be reduced (Tables 4.7-11 and 4.7-12). The area of construction impacts would be reduced about 15 percent to 303 acres in moose limited value winter range (1.5 percent of this habitat within the Project Area), and the area of operational facilities reduced to 187 acres in moose habitat (0.9 percent of available habitat in the Project Area). At full operation (years 10 to 20), 46 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 24 miles of new or upgraded roads to CBM field facilities. Assuming a displacement distance of 800 meters, the total area of displacement would be 12,250 acres (61 percent of available habitat in the Project Area). With winter road closure, the area of reduced habitat value would be reduced to 9,880 acres (49 percent of habitat available in the Project Area). These changes would be unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under Alternative C2, a number of big game security areas would again be restricted from development, mainly in the northwest quarter of the Project Area. Several of the active raptor nests are in these areas, and this alternative would reduce conflicts with three nests. However, because of the denser development, 2 more wells would be located within raptor buffer zones. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Thirteen raptor nests active between 1993 and 1995 would be within one-half mile of facilities,

including 8 golden eagle nests, 2 buteo nests, 1 Cooper's hawk nest, and 2 historic golden eagle nests recently occupied by prairie falcon. Twenty-six new wells would be within one-half mile of a recently active raptor nest, including 13 on federal lands, 6 on UDWR land, 5 on state land, and 2 on private land. About 12 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 6 miles on federal land and 1 mile on UDWR land. Seven of the 13 raptor nests would be protected by BLM environmental protection measures, but six raptor nests may be affected by facilities on non-federal land.

Sage Grouse

Alternative C1 would also provide areas suitable for sage grouse reintroduction, because there would be no development on Telephone or Cedar Benches. It would have less direct impacts on yearlong habitat than Alternative A, and more than Alternative B-2. It would affect 1,007 acres (3.2 percent) during construction, and 623 acres (2.0 percent) during operation (Table 4.7-14).

Other Upland Game

Alternative C2 would have impacts similar to the Proposed Action, but would have more habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 2,732 acres, or about 2.0 percent of general chukar habitat.
- II. Ring-necked pheasant: about 283 acres, or about 1.4 percent of general pheasant habitat.
- III. Desert cottontail: about 3,306 acres, or 1.8

percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, but a greater area of prairie dog complexes would be affected, the same as Alternative A. Alternative C2 would impact 382 acres of prairie dog towns, of which 225 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 3.2 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 25,200 burrows, of which about 14,850 would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds, reptiles and amphibians would be the same as for the Proposed Action, but a larger area of habitat would be affected. About 2.8 percent of the general habitat in the Project Area would be affected during construction and operation, including about 1.8 percent eliminated during the operational phase of the project and an additional 1.0 percent in areas of short-term disturbance.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be increased to about 27 acres.

4.7.2.7 Alternative D

This alternative was developed in a collaborative process between BLM and RGC, in consultation with UDWR and UDOGM. It

includes a number of project modifications designed to provide more protection for wildlife resources, including the following:

- I. No CBM development would occur in most of the Gordon Creek Wildlife Management Area
- II. Facility siting criteria would be used within big game minimum disturbance corridors (Plates 8a and 8b).
- III. BLM would not authorize well spacing of less than 160 acres on Federal lands within big game winter range.
- IV. RGC would meet its responsibilities for 1:1 habitat replacement by payment of \$1,250 for each federal well in critical winter range. Payments would go into a fund that would be used for habitat enhancement projects.
- V. The construction window in big game winter range would be increased to April 16 to November 31 (changed from May 16 to October 31), and authorized activities within the winter closure period are defined.
- VI. RGC would conduct non-emergency workovers in big game winter range outside of the seasonal closure window.
- VII. RGC would construct gates for winter closure at specific locations identified by BLM.

Alternative D would be the same as the Proposed Action, except for these changes. Impacts would be similar to those described for the

Proposed Action, except as described below. This alternative would provide suitable areas for habitat compensation projects, in Gordon Creek Wildlife Management Area and within some of the big game minimum disturbance corridors. It would meet the objectives of the Wildlife Mitigation (Appendix 4C), and would supersede Appendix 4C where there are differences in the specifics of mitigation.

The following discussion of impacts by species is based primarily on the well and facility locations displayed on Plate 8a. Some additional reduction in impacts may occur from application of the Site Location Standard at the APD stage. Potential results of the application of the Standard are shown on Plate 8b, including movement of wells and shortening of access roads within the Big Game Minimum Disturbance Corridors. These potential alternative locations have not been proposed or reviewed by RGC at this time. Actual locations would be developed at the APD stage.

Mule Deer

The types of impacts would be the same as for the Proposed Action. The same environmental protection measures would apply, except as described above. Impacts would be decreased because of the no-development area in the Gordon Creek Wildlife Management Area. Additional reductions in impacts may occur from reduced development in the big game minimum disturbance corridors, after application of the Site Location Standard.

Direct impacts on habitat from construction would be decreased by 5 percent (to 1,279 acres) for critical winter habitat and would be decreased by 26 percent (to 886 acres) for high value winter habitat (Table 4.7-1). About 891 acres (70 percent) of the construction impacts in critical winter habitat and 574 acres (65

percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (388 acres of critical winter range and 312 acres of high value winter habitat) would not be compensated. Impacts to non-federal lands would represent 0.7 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 8 percent in critical winter range (to 692 acres), and would decrease by 26 percent in high value winter range (to 530 acres). At full operation (years 10 to 20), 189 production wells, 3 injection wells, 3 evaporation ponds, and 1 compressor station would be located in critical winter range; and 122 production wells and 2 compressor stations would be located in high value winter range. In addition to existing paved roads, there would be about 35 miles of roads servicing gas field facilities in critical winter habitat, and 30 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be 16,374 acres in critical winter range (30 percent of that type in the Project Area), and 11,973 acres (23 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 10,005 acres in critical winter range (19 percent of available habitat in the Project Area), and 9,525 acres in high value winter range (18 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would probably be smaller than with the Proposed Action, because of the reduced development.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same

assumptions as for the Proposed Action, the loss of 18 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 2520 deer, and a reduction in the target buck harvest of 252 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Application of the Site Location Standard in Big Game Minimum Disturbance Corridors would result in some additional reductions in impacts. The corridors are designed to provide additional protection for mule deer, and are located in critical and high value winter range. Based on the potential relocations shown in Plate 8b, direct impacts may be reduced about 29 acres in critical winter habitat, and by 24 acres in high value winter habitat, compared to the locations shown on Plate 8a. Indirect impacts may be reduced about 5 percent (484 acres) in critical winter range, and about 5 percent (687 acres) in high value winter range, compared to the locations shown in Plate 8a. This would reduce the percentage of affected critical and high value winter habitat in the Project Area by 1 percent each, to 18 and 17 percent, respectively.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply, except as described above. Impacts would be greatly decreased because of the elimination of CBM development in most of the Gordon Creek Wildlife Management Area. Some additional

reduction in impacts, mostly in high value winter range could occur from application of the Site Location Standard within Big Game Minimum Disturbance Corridors.

Direct impacts on habitat from construction would be decreased by 39 percent (to 496 acres) for critical winter habitat, and by 4 percent (to 1,588 acres) in high value winter habitat (Table 4.7-4). About 356 acres (72 percent) of the construction impacts in critical winter range and 1,355 acres (53 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal land (140 acres of critical winter range and 233 acres of high value winter habitat) would not be compensated. Impacts to non-federal lands represent about 0.4 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 39 percent in critical winter range (to 290 acres), and by 4 percent in high value winter range (to 912 acres). At full operation, 72 production wells and 1 compressor station would be located in critical winter range; and 229 production wells, 3 injection wells, 2 compressor stations, and 3 evaporation ponds would be located in high value winter range. In addition to existing paved roads, there would be about 22 miles of roads servicing gas field facilities in critical winter habitat, and 45 miles of roads in high value winter habitat.

The area of direct impact from displacement would be decreased to 16,300 acres in critical winter habitat (54 percent of that type in the Project Area), and 49,293 acres (73 percent) in

high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 7,435 acres of critical winter range (24 percent of available habitat in the Project Area), and 35,953 acres in high value winter range (53 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than with the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 7 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 770 elk, and a reduction in the target bull harvest of 93 bulls (Table 4.7-6).

Black Bear

With Alternative D, the types of impacts would also be the same as with the Proposed Action, but the area of effect would be greatly reduced, and would be the least of any alternative (Table 4.7-7 and 4.7-8). About one-half of bear habitat in the Project Area would be protected within the Gordon Creek no development area. The area of construction impacts would be decreased by 59 percent to 232 acres, and the area of operational facilities decreased by 60 percent to 131 acres. The area of indirect impacts would be reduced by 58 percent, to 9,341 acres (35 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 31 production wells and 1 compressor station would be located in bear habitat. In addition to existing roads, there would be 13.8 miles of roads to CBM field facilities within black bear habitat. Although black bear use of the Project Area may be reduced by about one-third, adverse impacts to black bear populations

are likely to be minor because of their dispersed and low density occurrence.

Mountain Lion

Impacts under Alternative D would be similar in type but reduced in scale from those described for the Proposed Action. Restrictions on development in the Gordon Creek no-development area and siting criteria in the big game corridors would provide secure areas for mountain lions, and help to maintain them in the Project Area. Mountain lion could be displaced from about 65 percent (68,797 acres) of habitat, and result in a proportionate decrease in the mountain lion harvest, from 6 to 2.

Pronghorn Antelope

Impacts would be the same as with the Proposed Action.

Moose

Impacts would be much less than with the Proposed Action, and would be the lowest of any alternative, because most of the moose habitat in the Project Area would be in the Gordon Creek no-development area. Construction of the wellpads, roads, pipelines and other facilities would involve disturbance of removal of existing vegetation on 40 acres in moose limited value winter range (0.2 percent of this habitat within the Project Area). The project-long total of areas occupied by operational facilities would be 23 acres in moose habitat (0.1 percent). At full operation, 2 production wells would be located in moose limited value winter habitat. There would also be 3.6 miles of new or upgraded roads to CBM facilities. Assuming a displacement distance of 800 meters and winter road closures, the area of reduced habitat value would be reduced to 2,480 acres (12 percent). These changes would

be unlikely to have adverse effects on moose populations.

Raptors

Potential impacts would be reduced compared to the Proposed Action. Several raptor nests are located in the Gordon Creek no-development area, and would not be affected under Alternative D. Nine raptor nests would be affected, compared to 13 for the Proposed Action, and the number of wells within buffer zones would be reduced from 22 to 15. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Nine raptor nests active between 1993 and 1995 would be within one-half mile of facilities, including 7 golden eagle, 1 hawk (buteo), and 1 historic golden eagle nest used by prairie falcons during 1993-1995. Fifteen proposed wells would be within one-half mile of a recently active raptor nest, including 14 federal lands and 1 on state land. About 5 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 4 on federal land. Eight of the nine nests would be protected by BLM environmental protection measures, but one nest may be affected by facilities on non-federal lands.

Sage Grouse

This alternative would protect yearlong sage grouse habitat on Telephone, Cedar, and Horse Benches, and Bob Wright Canyon, and would provide the largest areas for sage grouse re-introductions. It would have reduced direct effects on sage grouse yearlong habitat, 704 acres (2.2 percent) during construction and 385 acres (1.2 percent) during operation (Table 4.7-14).

Other Upland Game

Alternative D would have impacts similar to the Proposed Action, but would have less habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 1,717 acres, or about 1.3 percent of general chukar habitat.
- II. Ring-necked pheasant: about 306 acres, or about 0.9 percent of general pheasant habitat.
- III. Desert cottontail: about 3,722 acres, or about 1.1 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action and the area affected would be the same. Alternative D would affect 244 acres of prairie dog towns, of which 130 acres would be occupied by facilities such as roads and well pads. This would be a loss of about 1.9 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 16,100 burrows, of

which about 8600 would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds, reptiles and amphibians would be the same as for the

Proposed Action, but a smaller area of habitat would be affected. About 2.0 percent of the general habitat in the Project Area would be affected during construction and operation, including about 1.1 percent eliminated during the operational phase of the and an additional 0.9 percent in areas of short-term disturbance.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be about 20 acres.

4.7.2.8 No Action Alternative

The No Action alternative would preclude CBM development on federal mineral estate lands; however, development on state and private lands would likely occur.

Impacts under this alternative would be similar to those described for the Proposed Action; however, the magnitude of the impacts under the No Action alternative would be much less than the Proposed Action because of the decreased number and density of wells. The analysis below only describes differences between the No Action alternative and the Proposed Action.

Mule Deer

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be greatly decreased because there would be little development on federal lands. However, development on other lands would still result in significant impacts.

Direct impacts on habitat from construction would be decreased by 62 percent (to 512 acres) for critical winter habitat and by 54 percent (to 552 acres) for high value winter habitat (Table 4.7-1). About 110 acres (22 percent) of the construction impacts in critical winter habitat and 121 acres (22 percent) in high value winter habitat would be on federal land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (402 acres of critical winter range and 431 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands would represent 0.8 percent of the winter range in the herd unit.

Areas occupied by operational facilities would decrease by 63 percent in critical winter range (to 279 acres), and by 55 percent in high value winter range (to 321 acres). At full operation (years 10 to 20), 65 production wells, 1 injection wells, 1 evaporation ponds, and one compressor station would be located in critical winter range; and 59 production wells, 1 injection well, 3 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 39 miles of roads servicing gas field facilities in critical winter habitat, and 49 miles of roads in high value winter habitat.

The area of indirect impact from displacement

would be 6,273 acres in critical winter habitat (12 percent of that type in the Project Area), and 7,630 acres (15 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 4,329 acres in critical winter range (8 percent of available habitat in the Project Area), and 4,418 acres in high value winter range (9 percent) (Table 4.7-2). Increases in mortality from vehicle collisions and legal and illegal hunting would be decreased from the Proposed Action, because of the smaller road network.

All of the RGC facilities in critical and high value winter range would be located within the Northeast Manti herd unit. Using the same assumptions as for the Proposed Action, the loss of 8 percent of the winter range carrying capacity would lead to a reduction in the target Northeast Manti deer herd of 1,120 deer, and a reduction in the target buck harvest of 112 bucks (Table 4.7-3). The mule deer population is currently much lower than the target, and the project therefore may not cause direct mortality of existing deer, but would limit future rebounds in population.

Elk

The types of impacts would be the same as for the Proposed Action, and the same environmental protection measures would apply. Impacts would be greatly decreased because there would be little development on federal lands. However, development on other lands would still result in significant impacts.

Direct impacts on habitat from construction

would be decreased by 46 percent (to 433 acres) for critical winter habitat and by 64 percent (to 600 acres) on elk high value winter habitat (Table 4.7-4). About 56 acres (13 percent) of the construction impacts in critical winter habitat and 149 acres (25 percent) in high value habitat would be on BLM land and subject to requirements for compensatory enhancement of adjacent habitat. Areas of direct effect on non-federal lands (377 acres of critical winter range and 451 acres of high value winter habitat) would not be compensated, except potentially on UDWR lands. Impacts to non-federal lands represent about 0.8 percent of the winter range in the Project Area.

Areas occupied by operational facilities would decrease by 48 percent in critical winter range (to 245 acres), and by 64 percent in high value winter range (to 339 acres). At full operation, 56 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in critical winter range; and 66 production wells, 1 injection well, 2 compressor stations and 1 evaporation pond would be located in high value winter range. In addition to existing paved roads, there would be about 34 miles of roads servicing gas field facilities in critical winter habitat, and 50 miles of roads in high value winter habitat.

The area of indirect impact from displacement would be decreased to 16,856 acres in critical winter habitat (55 percent of that type in the Project Area), and to 27,794 acres (41 percent) in high value winter range. Winter road closures would reduce harassment and disturbance in large parts of this area, and overall reductions in habitat value are estimated to be 6,492 in critical winter range (21 percent of available habitat in

the Project Area), and 21,346 acres in high value winter range (32 percent) (Table 4.7-5). Increases in mortality from vehicle collisions and legal and illegal hunting would likely be less than would the Proposed Action.

All of the RGC facilities in critical and high value winter range would be located within the Manti elk herd unit. Using the same assumptions as for the Proposed Action, the loss of 6 percent of winter range carrying capacity would lead to a reduction in the target Manti elk herd of 660 elk, and a reduction in the target buck harvest of 78 bulls (Table 4.7-6).

Black Bear

Under the No Action alternative, the types of impacts would also be the same as for the Proposed Action, but the area of effect would be reduced, especially for indirect impacts (Tables 4.7-7 and 4.7-8). About one-quarter of black bear habitat is on BLM lands, where there would be little or no development, but activities on the three-quarters of the habitat on other lands would proceed, and result in substantial losses of habitat. The area of construction impacts would be decreased about 28 percent to 406 acres, and the area of operational facilities decreased about 30 percent to 231 acres. The area of indirect impacts would be reduced about 23 percent, to 17,207 acres (65 percent of black bear habitat in the Project Area). At full operation (years 10 to 20), 46 production wells, 1 injection well, 1 evaporation pond, and two compressor stations would be located in bear habitat. In addition to existing roads, there would be 33 miles of roads to CBM field facilities within black bear habitat. With nearly two-thirds of its habitat potentially affected, black bear could be eliminated from the Project Area, and would continue to be present only if animals were able to adapt to the increased level of human activity. However, considering the typically dispersed and low density occurrence of black bear, adverse impacts to black bear populations would likely be minor and non-significant.

Mountain Lion

Impacts under the No Action alternative would be similar in type to the Proposed Action but greatly reduced because there would be little development on federal land. Mountain lion could be displaced from about 44 percent (46,424 acres) of habitat, resulting in a proportionate decrease in the mountain lion harvest, from 6 to 3.

Pronghorn Antelope

The types of impacts to pronghorn antelope would be similar to the Proposed Action, and the same environmental protection measures would apply. Impacts would be decreased because of the elimination of most development on federal lands.

Direct impacts from construction would be decreased by 41 percent (to 516 acres) within antelope high value yearlong habitat (0.6 percent of habitat available in the Project Area), and by 53 percent to 307 acres of potential antelope habitat (0.5 percent) (Table 4.7-9). Based on a displacement distance of 100 meters, antelope would be displaced from 3,138 acres of high value yearlong habitat during construction (6 percent of that available in the Project Area) (Table 4.7-10). Although antelope do not currently occur west of Highway 10, noise and disturbance would make 1583 acres (5.5 percent) of potential habitat unsuitable for future occupancy.

The area occupied by operational facilities would also decrease, to 294 acres in high value yearlong habitat, and 143 acres in potential yearlong habitat. Displacement effects would

continue during operation, although some habituation may occur which would reduce the area of effect. At full operation (years 10 to 20), 79 production wells and 45 miles of new or improved roads would be located in high value winter habitat. The likelihood of future expansion of antelope populations into the potential habitat west of Highway 10 may be reduced; project facilities planned for that area include 23 wells, 2 evaporation ponds, 1 injection wells, 1 compressor station, and 19 miles of new or improved roads, along with 79 existing wells. Although displacement effects are likely to result in decreased use of the Project Area by antelope, they are unlikely to have significant adverse effects on overall antelope populations even at full development, because less than 1 percent of habitat available within the herd unit would be affected, and no critical habitat would be affected. Some increases in hunting and harassment are likely to occur, and may also reduce the number of antelope in the Project Area.

Moose

The types of impacts would be the same as for the Proposed Action, but the area of impact would be reduced (Tables 4.7-11 and 4.7-12). The area of construction impacts in moose habitat would be reduced about 23 percent to 274 acres, and the area of operational facilities would be reduced about 25 percent to 160 acres. At full operation (years 10 to 20), 27 production wells, 1 injection well, 1 evaporation pond, and one compressor station would be located in moose limited value winter habitat. There would also be 33 miles of new or upgraded roads to CBM field facilities. The area of indirect impacts would be reduced to 13,137 acres, about 65 percent of the habitat available in the Project Area. With winter closure, the area of reduced habitat value would be reduced by about 11 percent compared to the Proposed Action, to 10,844 acres, or about 54 percent of the limited value winter habitat in the Project Area. These changes to habitat are unlikely to have adverse effects on moose populations, because the affected habitat is of limited value.

Raptors

Under the No Action alternative, there would be only minor developments on federal lands, and most raptor nests would be more than one-half mile from proposed facilities, resulting in much fewer conflicts than with the Proposed Action. Only four recently active raptor nests would be in conflict with new development, and only seven wells would be affected. The types of impacts and applicable environmental protection measures would be the same as for the Proposed Action.

Four raptor nests active between 1993 and 1995 would be within one-half mile of proposed facilities, including 2 golden eagle nests, 1 buteo

nest, and 1 Cooper's hawk nest. Seven new wells would be within one-half mile of a recently active raptor nest, including 1 on federal lands, 5 on UDWR land, and 1 on state land. About 2.5 miles of transportation corridor would be within buffer zones of recently active raptor nests, including about 1 mile on federal land and 1.5 mile on UDWR land. All four of the raptor nests may be affected by activities on non-federal lands.

Sage Grouse

This alternative would provide some areas suitable for sage grouse reintroduction. There would be no wells on Horse Bench, and the number of wells on Cedar Bench would be reduced from 5 to 2. It would also have reduced direct effects on sage grouse yearlong habitat, 600 acres (1.9 percent) during construction and 347 (1.1 percent) during operation (Table 4.7-14).

Other Upland Game

The No Action alternative would have impacts similar to the Proposed Action, but would have less habitat occupied by well field facilities for the life of the project. Reductions in carrying capacity and reductions in upland game populations would be:

- I. Chukar: about 830 acres, or about 0.6 percent of general chukar habitat.
- II. Ring-necked pheasant: about 167 acres, or about 0.8 percent of general pheasant habitat.
- III. Desert cottontail: about 1,050 acres, or about 0.6 percent of general habitat.

White-tailed Prairie Dog Complexes

The types of impacts would be similar to the Proposed Action, but a much smaller area of prairie dog complexes would be affected. The No Action alternative would impact 95 acres of prairie dog towns, of which 41 acres would be occupied by facilities such as roads and wellpads. This would be a loss of about 0.6 percent of current prairie dog habitat, for the life of the project. Construction would destroy or disturb about 6,300 burrows, of which about 2,700 acres would be in areas occupied by roads or wellpads.

Other Species

The types of impacts to songbirds, reptiles and amphibians would be the same as for the Proposed Action, but a smaller area of habitat would be affected. About 1.0 percent of the general habitat in the Project Area would be affected during construction and operation, including about 0.6 percent eliminated during the operational phase of the project.

The types of impacts to waterfowl and shorebirds would be the same as for the Proposed Action. The area of new surface water habitat created would be reduced to 14 acres.

4.7.3 Impacts Summary

A comparison of the impact of the Proposed Action and the seven alternatives is provided in Table 2.8-2. All of the alternatives would involve similar types of impacts, but the magnitude of impact would vary according to the number and distribution of CBM facilities. All of the alternatives would involve significant impacts to big game, and much of the development in big game habitat would be on non-federal lands, and would not be covered by BLM-required environmental protection measures or mitigation.

Impacts would occur from disturbance of habitat during construction, long-term occupancy of habitat by aboveground facilities, increased human presence and activity at all seasons, increased public use of the expanded and improved road network, higher potential for collisions, and improved access for legal and illegal hunting and harassment. Displacement of animals away from human activities would likely have the greatest adverse effects, and would make large areas of habitat unsuitable for wildlife use.

Direct impacts related to construction would occur over a 6 to 10 year period at the beginning of the project. Operational impacts would extend throughout the 30 year project, but would be highest in the middle years after all wells and roads have been constructed, and before any have been abandoned and reclaimed. For most species, indirect (displacement) impacts would be greatest during this period. Wells would be abandoned and reclaimed at the end of their estimated 20 year life span, and would decrease in number

through the last 10 years of the project. At the end of the project, approximately 30 years after startup, all wells would be reclaimed, but some roads may remain open. Wildlife displaced from the area during operation may reoccupy the Project Area as the project facilities are closed.

Quantitative impacts are evaluated and compared for direct disturbance of habitat, and for indirect (displacement) effects, for mule deer, elk, black bear, pronghorn antelope, moose, and raptors. For mule deer, elk, and pronghorn antelope, several different types of habitat are evaluated, representing different types of seasonal use and importance. The eight alternatives would generally affect between 1 and 4 percent of the specific seasonal habitats available in the Project Area. Elk and deer winter habitats overlap in the Project Area. A summary of impacts to combined elk and deer critical and high priority habitat is provided in Table 4.7-13. Direct impacts to elk and deer habitat on federal lands would be compensated by habitat enhancement projects.

Displacement effects would impact much larger areas than direct effects. Displacement effects would be reduced by using gate closures where possible to minimize motorized vehicle access to winter habitat during the critical season. The seven alternatives would have the following indirect effects, in terms of acre reductions of habitat value, and percent of the habitat available in the Project Area:

- I. 4,300 to 13,000 acres of deer critical winter habitat (8 to 24 percent)
- II. 4,400 to 13,400 acres of deer high value winter habitat (8 to 26 percent)
- III. 6,500 to 10,800 acres of elk critical winter habitat (21 to 36 percent)

- IV. 21,300 to 38,502 acres of elk high value winter habitat (32 to 57 percent)
- V. 9,300 to 22,400 acres of black bear high value yearlong habitat (35 to 85 percent)
- VI. 46,000 to 84,400 acres of mountain lion habitat (44 to 80 percent)
- VII. 3,400 to 8,300 acres of antelope high value yearlong habitat (6 to 17 percent)

Funds provided under the BLM's Wildlife Habitat Mitigation Program would reduce the magnitude of indirect impacts to area deer and elk, but would not eliminate them. The Proposed Action and Alternative A would not have large blocks of undisturbed habitat available for habitat enhancement, unlike the other alternatives.

Reductions in elk and deer winter range would be likely to lead to reduced regional populations. Mule deer winter range in the Project Area makes up most of the winter range available in the Northeast Manti deer herd unit, and elk habitat in the Project Area provides about 30 percent of the winter range for the Manti elk herd. The various alternatives would displace wildlife from about 8 to 23 percent of winter habitat for the North Manti deer unit, and 6 to 11 percent of winter habitat for the Manti elk herd, resulting in corresponding population reductions (or limits on future growth), and reductions in harvest. Loss of black bear, antelope, and moose habitat would be unlikely to have adverse effects on regional populations or harvest, although local use would be reduced.

Between 4 and 14 recently active raptor nests would be located within one-half mile of CBM facilities. Adverse indirect effects would be limited by several environmental protection

measures.

In general, Alternative B1 and the No Action alternative would have the lowest impacts, and Alternative A the highest impacts, followed by Alternative C2. The BLM preferred alternative (D), critical areas avoidance alternatives (B1 and B2), and security areas protection alternatives (C1 and C2) would provide protection for much of the most critically valued habitats for big game, black bear, mountain lion, and sage grouse; protects the primary migration corridor for the Gordon Creek winter range, and provide the opportunity for wildlife habitat enhancement projects within the Project Area.

4.7.4 Mitigation

The environmental protection measures described in Section 2.2.5 would provide some protection for wildlife resources. However, additional mitigation measures are recommended to reduce impacts or to compensate for impacts.

Direct and indirect impacts to wildlife critical and high value winter habitat should be mitigated consistent with the BLM's Wildlife Habitat Mitigation Plan (Appendix 4C). Impacts should be mitigated, to the extent possible, within the same herd unit, in order to benefit the impacted population. Impacts should be mitigated within the Project Area if possible, but may be mitigated off-site or outside of the herd unit. Existing requirements for 1:1 enhancement of adjoining habitat for surface disturbing activities on critical winter range (BLM 38) should be extended to include impacts to high value winter habitat. These should include physical habitat enhancement projects such as

vegetation treatments to increase the quality and quantity of forage. Displacement impacts to critical and high value winter habitats should be mitigated through changes in surface management, to eliminate resource conflicts (such as eliminating competition with wildlife resources on critical winter range).

Exploratory drilling should be conducted on critical and high value big game habitat to assess the extent of the CBM resources and facilitate mitigation planning. Areas with limited CBM potential should be set aside for wildlife habitat.

With permission of landowners, RGC should install design features (speed bumps or dips) to limit excessive rates of speed in sensitive wildlife habitat, to reduce the potential for vehicle collisions with wildlife.

Wells and facilities should be placed behind visual screens, such as topography and dense pinyon forest. Placement of wells, roads and facilities along forest/sage-grassland edge should be avoided.

RGC's information and education program should include local, state and federal wildlife laws and regulations, general natural history and wildlife species of the area, potential impacts to wildlife, and measures to avoid or mitigate impacts to wildlife. Workers should be instructed to report raptor nests, sage grouse observations, wildlife mortalities, and other noteworthy observations to the BLM and UDWR.

4.7.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to wildlife and fisheries would be direct loss of some habitat; displacement of mule deer and elk from winter range; and increase in potential for vehicle related wildlife mortalities and injuries. Adequate sized and suitable areas for mitigation of direct and indirect impacts may not be available within the Project Area or herd units, and wildlife

winter habitat carrying capacity and deer and elk populations may be reduced for the life of the project. Implementation of mitigation as described in Sections 2.2.5 and 4.7.3 would reduce, but not eliminate, impacts. In addition, a lag time of vegetation establishment would likely occur between the initiation of reclamation and habitat enhancement and the establishment of

big game habitat of equal quality to habitat lost. This could result in the short-term reduction in carrying capacity of big-game for the first one to five years, depending on the relative scheduling of habitat enhancement and the construction of wells and roads.

4.8 SPECIAL STATUS SPECIES

4.8.1 Introduction

Thirteen species of federally listed threatened or endangered plant or animal species, and 17 other sensitive species have been identified as potentially occurring within Carbon and Emery counties. These include 9 species of plants, 7 species of terrestrial wildlife, 8 species of bats, and 6 species of fish.

As described in Section 3.8, this EIS will serve as a Biological Assessment as part of BLM's compliance with Section 7 of the Endangered Species Act. The description of the Proposed Action is provided in Chapter 2, description of the affected environment for listed threatened and endangered species is provided in Section 3.8.3, and analysis of project effects is provided in this section. Project effects to be addressed include direct, indirect, beneficial and cumulative impacts, and those caused by interrelated and interdependent actions. Cumulative effects under ESA regulations refers to state and private actions that are reasonably certain to occur within the Project Area in the foreseeable future. In this context, impacts from project development on state and private lands outside of federal mineral ownership would be considered as cumulative effects for the Biological Assessment, since BLM has no authority to permit or deny them. These types of impacts are discussed below under direct and indirect impacts, rather than in Chapter 5. This section also includes a

summary of conclusions regarding whether the BLM's action (approval of the project on federal land) may affect a listed species. A summary of the conclusions for listed species is provided in Table 4.8-1. Copies of correspondence are included in Appendix 3C.

The other 17 species evaluated in this section are not protected under the federal ESA, but are considered sensitive by BLM and state agencies.

Federally endangered threatened and endangered species are protected under the ESA, and compliance with the ESA would be required under federal law and under standard lease terms, for all project components.

Sensitive species are protected on federal lands under BLM policies and guidelines. Environmental protection measures listed in Section 2.2.5 that may minimize impacts to endangered, threatened and sensitive species include RGC 12 (speed limits), RGC 14 (seasonal avoidance of raptor nests), BLM 1(site selection), BLM 4 to 5 (avoidance of streams and springs), BLM 8 to 23 (erosion control and reclamation), BLM 31 to 35 (water-related measures), BLM 36 (avoidance of wetland and riparian areas), BLM 40 (raptor nest buffer zones), BLM 41 (raptor surveys), and BLM 41A (bald eagle roost buffer zones).

4.8.2 Direct and Indirect Impacts

4.8.2.1 Proposed Action

Federal Endangered and Threatened Species

Bald Eagle. Potential impacts to bald eagles include increased mortality and disturbance to winter roosts.

Bald eagles that pass through the Project Area or roost within the Project Area during winter may be attracted to road killed wildlife, and would therefore be more vulnerable to injury or death from increased vehicle traffic as a result of CBM construction and operation. The death of a single bald eagle would constitute a significant impact. However, speeds on collector, local, and resource roads would be maintained below 25 mph and would therefore be unlikely to increase eagle mortality.

Four bald eagle winter roost sites were identified during surveys conducted in the winter of 1994-1995. Direct removal or disturbance to roosts would cause the abandonment of the roost and may be subject to prosecution under the "takings" provision of the ESA. However, no existing bald eagle winter roost would be removed by any alternative.

Any activity within 0.25 miles (400 meters) of critical bald eagle roosts during the winter (October 15 to March 15) could potentially cause the abandonment of the roost (Martell 1992), and may also be considered a "takings" under the ESA. Where disturbance is in line of sight of the roost, 0.25 miles may not be adequate to prevent disturbance. Environmental Protection Measure BLM41A specifies that there be no surface occupancy within 0.5 mile of a winter roost, except where authorized on a case by case basis through joint consultation

with the BLM, USFWS, and UDWR, based on topography and visual sight distances around the night roost site. Facilities located within 0.5 and 0.25 miles of bald eagle roosts are summarized in Table 4.8-2, for each of the alternatives. The Gordon Creek East and Gordon Creek West roosts would each have a proposed well located 0.25 to 0.5 mile from the roost, along with short segments of local roads. In addition, about one mile of the existing Consumers Wash Road is also located within the 0.5 mile buffer zone of the Gordon Creek West communal roost. Three proposed wells and 2.1 miles of proposed local road would be located within 0.5 mile of the Bull Point site. No proposed facilities are located near the Miller Creek site. All of these facilities are located on UDWR land, except for 1 well at the Bull Point site.

With implementation of BLM 41A, both direct and indirect impacts to bald eagles and to critical winter roost sites would be unlikely to occur under the Proposed Action.

Peregrine Falcon. Potential impacts include disturbance or harassment of nesting birds, leading to nest failure or abandonment, and reduction of prey base.

The peregrine falcon nest discovered in 1996 is located on a cliff at the edge of the Project Area, and overlooks the Project Area. USFWS and UDWR guidelines for protection of peregrine nests (USFWS 1984; Zoblan 1996; Bates 1996a) provide for a one-mile buffer zone around active nests during the breeding season (February 15 to July 15). Construction activity would not be allowed during this period, but could occur during other parts of the year., and operational activities would not be restricted within this buffer zone. With this mitigation, significant disturbance to nesting peregrines would be unlikely. Only a few project facilities

would be affected by this requirement: four proposed wells and about 2 miles of access road are located within 1 mile of the 1996 nest site. The closest wells are slightly more than one-half mile away, and about one-quarter mile of proposed road is within one-half mile. One of the proposed wells and some of the access road are located on Utah state land, and the remainder are on BLM land. The numbers and locations of facilities within 1 mile may vary in the future if the peregrine pair use a different nesting site.

Environmental protection measures that would additionally reduce the potential for impacts to nesting peregrines include RGC 10 (prohibition of carrying firearms by employees and contractors), RGC 11 (training on wildlife protection measures), BLM 40 (no surface occupancy within one-half mile of nests active within a three year period), and BLM 41 (spring raptor surveys of areas proposed for construction).

Prey populations (mainly medium and small sized birds) may be slightly reduced by removal of vegetation. Within one mile of the nest, the amount of vegetation occupied by operational facilities would be about 15 acres, or about 1 percent of this area. About 80 percent of the proposed project facilities would be built within a 10-mile radius of the nest (the radius of the average hunting area), and would result in removal of about 1 to 2 percent of the vegetation during operation. Additional short-term vegetation loss would occur during construction.

Peregrine falcon populations in central and southern Utah are healthy and expanding. The

110 nesting pairs now present exceeds the recovery goals for this population (Bates 1996a).

Black-footed Ferret. Partial winter surveys and complete summer surveys of all known prairie dog towns within the Price River CBM Project Area and areas of influence, found no evidence of black-footed ferrets. Surveys were conducted according to USFWS survey protocol by trained biologists. Based on the results of these surveys, development of the Price River CBM Project would not likely impact the black-footed ferret.

Colorado River Fish. The closest documented occurrence of threatened and endangered Colorado River fish (Colorado River squawfish, humpback chub, bonytail chub and razorback sucker) is in the lower Price River, and they would not be directly affected by the Proposed Action.

Consumptive water use associated with the project is shown in Table 2.2-7. Consumptive use of water from the Colorado River Basin would total 494 ac-ft over the life the project, or about 49 ac-ft per year. This amount of consumptive use is below the 100 ac-ft annual use threshold for compensation, established by USFWS, and is unlikely to result in adverse impacts. The depletions associated with the project would be covered under the Final Biological Opinion for Water Depletion Projects in the Moab District Over the Next Five Years (USDI, FWS, May 4, 1994, ES/6-UT-94-008). This covered the combined and cumulative effects of numerous small projects, with a total estimated depletion of 531 ac-ft from 1994 to 1998.

Indirect impacts such as degradation of water

quality within Colorado River fish habitat are also unlikely. Although disturbance to saline soils could increase erosion and runoff of dissolved salts into surface water, impacts are likely to be minor and local, and unlikely to affect habitat 15 miles or more downstream from the Project Area. As discussed in Sections 4.2.2.1 and 4.4.2.1, no long-term adverse impacts to surface water quality are anticipated. The Utah water quality standards and Colorado River Basin Salinity Control Forum standards would not be exceeded due to project activities. Erosion and sedimentation, and associated salt or selenium delivery would not increase beyond existing conditions. Wells and other facilities would be located to minimize ground surface disturbance within 330 feet of perennial streams. In addition, erosion control and revegetation measures would be implemented which would help minimize runoff.

Endangered or Threatened Plants. The six listed plant species in Emery County (Barneby reed mustard, Jones cycladenia, Last Chance townsendia, Maguire daisy, San Rafael cactus, and Wright fishhook cactus) are highly unlikely to occur in the Project Area, and the project will have no impacts on them.

Sensitive Species

Northern Goshawk. No impacts to northern goshawks are anticipated due to lack of suitable habitat for this species. No northern goshawks or potential breeding habitat were identified during surveys of the Price River CBM Project Area. An occasional goshawk may pass through the area during migration or forage in the higher elevations, but would be unlikely to nest within the Project Area.

Ferruginous Hawk. Ferruginous hawk are known to nest within the Project Area, and one active nest was found during a detailed raptor nest survey for this project (Parrish 1995). This nest is located several miles from the nearest planned project facility and outside the project

boundary, and would not be affected. There are other recent and historic ferruginous hawk nest locations near project facilities. Ferruginous hawks are very sensitive to human disturbance and would likely abandon a nest if disturbed. On federal lands, adverse effects would be unlikely with the application of environmental protection measure BLM 40. RGC 14 would similarly protect nesting ferruginous hawks during construction but would not protect nests from disturbance during operation and maintenance. These activities on private or state land could cause nest abandonment and mortality to young if ferruginous hawks occupied a nest near project facilities.

Western Burrowing Owl. Approximately 7,094 acres of prairie dog towns occur within the Project Area (MDG 1995b) that could provide breeding habitat for the burrowing owl. Any disturbance to prairie dog towns that affect openness, vegetation height, prairie dog densities, and burrow availability have the potential to adversely impact burrowing owl populations. Of these four components, short vegetation height and burrow availability are the most critical for maintaining owl populations (Marks and Ball 1983, Thomsen 1971, Martin 1973, Zarn 1974). Burrowing owls apparently acclimate to human presence and can be found in disturbed open areas such as road cuts and airports (Finch 1992). Owls also tend to select their burrows in areas with other burrows close to roads (Plumpton 1992) and vehicle traffic has little impact on productivity of burrowing owls (Plumpton and Lutz 1993), although there is a potential for collisions with vehicles. There may also be increased mortality from shooting.

The primary direct effect of the project would be destruction of nesting burrows during the nesting season (April to August) (Haug et al. 1993). Because of the extent of prairie dog towns within the Project Area it would not be possible to minimize possible impacts to burrowing owls by avoiding placement of well, roads and other facilities in prairie dog towns.

If construction is planned during the egg-laying to fledging period (April to August), a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nest burrows. If present, construction on or immediately adjacent to nesting burrows should be avoided or delayed until the end of nesting. RGC employees and contractors should report all observations of active burrowing owl nests to the BLM. On federal lands, adverse impacts would be minimized with use of this mitigation.

Loggerhead Shrike. Construction may result in destruction of active shrike nests or disturbance sufficient to cause abandonment of the nests, which would be considered a significant impact. Additional hunting perches would be created by overhead powerlines and structures on well pad sites. Construction of wellpads and roads would result in temporary removal of the vegetation on about 194 acres of shrike habitat, of which 107 acres would be occupied by aboveground facilities during the life of the project (Table 4.8-3). This represents about 1 percent and 0.5 percent of shrike habitat in the Project Area.

If construction is planned during the breeding season (April to mid-July) in potential shrike habitat, a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nests. If present, construction on or immediately adjacent to nests should be avoided or delayed until the end of nesting. RGC employees and contractors should report all observations of active nests to the BLM. On federal lands, adverse impacts would be unlikely with use of this mitigation.

Spotted Bat. No spotted bats have been documented within the Project Area, but the Project Area includes potentially suitable habitat and they are likely to occur (Toone 1993, 1995). The most critical factor in spotted bat habitat is the presence of cracks and crevices of the right size in limestone or the preferred sandstone formations (Poche 1981). Because few, if any, sandstone cliff formations would be disturbed by the Proposed Action, adverse impacts to spotted bats are unlikely. Additionally, spotted bats are apparently tolerant to human presence as major roosting areas have been documented near heavy human disturbance (Fenton et al. 1987, Navo 1990).

Other Bats. Seven other sensitive (former category 2) bat species may occur in the Project Area. The project is unlikely to affect foraging bats or food supply, or typical roosts in caves, mines, and crevices in cliffs. Bats roosting in trees could be disturbed during construction, and bats attempting to use compressor station vent stacks may be killed or injured. These impacts would be unlikely to affect overall populations of these species in the Project Area and region.

Milk Snake

Milk snakes are considered rare in the Project Area, but may occur in nearly all of the vegetation types. Their occurrence in southeastern Utah is on the western edge of their distributional range. They are secretive, largely subterranean in southeastern Utah (Dalton et al

1990), and may be active day or night depending on the weather. Milk snakes may be killed or injured during ground-disturbing activities such as road and wellpad construction, and may be killed on roads during the operational period. Aboveground facilities will occupy about 1 percent of the Project Area at full build-out, and may slightly reduce the carrying capacity of the habitat. Overall impacts to milk snake in the Project Area would be minor, and would not adversely affect regional populations.

Colorado River Fish. Impacts to sensitive Colorado River fish would be the same as those previously described for threatened and endangered Colorado River fish. No direct or indirect adverse impacts to roundtail chub or

flannelmouth sucker are likely to occur, from reduction of water quantity or quality.

Creutzfeldt Catseye (Cryptantha). There will be no direct impacts to the two known occurrences near Price, and the nearest project facility would be located almost a mile away. Both of these known locations are on private land. This species could potentially occur at currently undiscovered locations on Mancos shale badlands at elevations of 5,600 to 6,800 feet throughout the Project Area. If present in construction areas, construction of project facilities could destroy individual plants and may jeopardize local populations. Impacts would be significant if they threatened the viability of the local population, and/or induced an upgrade in status. Impacts would be minimized or avoided through pre-construction surveys followed by avoidance or mitigation of impacts.

Canyon Sweetvetch. This species could potentially occur at currently unknown locations in mesic and shaded areas along perennial and intermittent streams and washes in the Project Area. Existing stipulations and mitigations would protect most potential habitat on federal lands. This includes the existing BLM stipulation that prohibits occupancy or surface disturbance within 330 feet of the centerline or within the 100-year recurrence interval floodplain (whichever is greater) of perennial streams. Impacts would be further minimized or avoided through pre-construction surveys followed by avoidance or mitigation of impacts.

Graham Beardtongue. This species is highly unlikely to occur in the Project Area, and the project would have no impacts on it.

4.8.2.2 Alternative A

Alternative A would increase the density and number of wells to 1,105, and increase the number of roads, pipelines, electrical lines and ancillary facilities (Section 2.3). The land area disturbed would be about 40 percent greater than the Proposed Action.

Impacts to listed threatened and endangered species would be the same as for the Proposed Action. Bald eagles occur in the Project Area, but are not likely to be adversely affected. The number of wells and miles of roads within the bald eagle roost buffer zone would be the same as in the Proposed Action, except for 2 additional wells and 0.2 miles of road near the Bull Point site. All of the facilities within bald eagle buffer zones would be on UDWR lands, except for 1 well at the Bull Point site. Peregrine falcon also occur but are not likely to be adversely affected by construction and operation of facilities near the nest. Five wells and about 2.25 miles of access roads would be within 1 mile of the 1996 nest site. The same stipulations and mitigations would apply as in the Proposed Action. Four Colorado River fish species occur 50 or more miles downstream, and would be unlikely to be adversely affected. Average annual consumption of water from the Colorado River drainage would be 85 acre-feet/year, the highest use for any of the alternatives. Black-footed ferret and six listed plant species are not known or expected to occur in the Project Area, and would not be affected.

Impacts to sensitive species from this alternative would be similar to those described for the Proposed Action. There would be more surface disturbance and human activity potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and

sensitive plant habitat. About 281 acres (1.5 percent) of shrike habitat would be

directly affected during construction and 178 acres (1 percent) of shrike habitat occupied by aboveground facilities during the operational phase. On federal lands mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar. BLM mitigations would not apply on non-federal lands, and the project may adversely impact these species if they are present near project facilities. About 48 percent more SITLA and private land would be disturbed by Alternative A compared to the Proposed Action. Impacts to all other species would be the same as for the Proposed Action.

4.8.2.3 Alternative B1

Alternative B1 would preclude CBM well development on the federal mineral estate within the combined deer and elk critical winter range under the 160-acre well spacing scenario (Section 2.4.1). The area of surface disturbance would be about 75 percent of the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action, except that there would be only 1 proposed well within 0.5 miles of the bald eagle winter roost, and only 3 wells within 1 mile of the 1996 peregrine falcon nest site.

Impacts on sensitive species from this alternative would be similar to those described for the Proposed Action. There would be less surface disturbance and human activity potentially conflicting with loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 92 acres (0.5 percent) of shrike habitat would be directly affected during construction and 48 acres (0.3 percent) of shrike habitat occupied by aboveground

facilities during the operational phase. Impacts to burrowing owl habitat (prairie dog towns) would be about the same as the Proposed Action. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.2.4 Alternative B2

Alternative B2 would preclude CBM well development on the federal mineral estate within the combined deer and elk critical winter range under the 80-acre well spacing scenario (Section 2.4.2). The area of surface disturbance would be about 10 percent larger than for the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action except that there would be only 1 proposed well and 0.5 miles of road within 0.5 miles of a bald eagle winter roost, and only 3 wells within 1 mile of the 1996 peregrine nest site.

Impacts to sensitive species from this alternative would be similar to those described for the Proposed Action. There would be more surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 129 acres (1 percent) of shrike habitat would be directly affected during construction and 75 acres (0.5 percent) of shrike habitat occupied by aboveground facilities during the operational phase. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.2.5 Alternative C1

This alternative would restrict development within concentration (security) areas for mule deer and elk on BLM and UDWR lands. The area of surface disturbance would be about 8 percent less than the Proposed Action. Effects on listed threatened and endangered species would be the same as for the Proposed Action. There would be no wells within the Gordon Creek East bald eagle buffer zone and 2 wells near the Bull Point site.

Impacts to sensitive species would be similar to the Proposed Action. There would be slightly less disturbance potentially conflicting with loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 157 acres (1 percent) of shrike habitat would be directly affected during construction and 86 acres (0.5 percent) of shrike habitat occupied by aboveground facilities during the operational phase. Impacts to burrowing owl habitat (prairie dog towns) would be about the same as the Proposed Action. Impacts to all other species would be the same as for the Proposed Action. Mitigations and residual impacts after mitigation would also be the same.

4.8.2.6 Alternative C2

This alternative would restrict development within concentration (security) areas for mule deer and elk on BLM and UDWR lands, combined with an increase in well density to 80-acre spacing. The area of surface disturbance would be about 38 percent more than the Proposed Action.

Effects on listed threatened and endangered species would be the same as for the Proposed Action except that there would be no wells within the Gordon Creek East bald eagle roost buffer zone, and 5 wells within 1 mile of the

1996 peregrine falcon nest site.

Impacts to sensitive species would be similar to the Proposed Action. There would be more surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 225 acres (1.5 percent) of shrike habitat would be directly affected during construction and 140 acres (1 percent) of shrike habitat occupied by aboveground facilities during the operational phase. Impacts to all other species would be the same as for the Proposed Action. Mitigations and residual impacts after mitigation would also be the same.

4.8.2.7 Alternative D

This alternative would restrict development in most of the Gordon Creek Wildlife Management Area, and would use well siting criteria within big game migration corridors. The area of disturbance would be about 9 percent less than the Proposed Action.

Effects on listed threatened and endangered species would be the same as the Proposed Action. There would be no proposed facilities within 0.5 mile of bald eagle winter roosts (Table 4.8-2).

Effects on sensitive species would be similar to the Proposed Action. There would be less surface disturbance potentially affecting loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 194 acres (1 percent) of shrike habitat would be directly affected during construction and 107 acres (0.5 percent) of shrike habitat occupied by aboveground facilities during the operational phase. Impacts to burrowing owl habitat (prairie dog towns) would be about the same as the Proposed Action. Impacts to all other

species would be the same as the Proposed Action. Mitigations and residual impacts after mitigation would also be the same.

4.8.2.8 No Action Alternative

The No Action alternative would preclude CBM development on federal mineral estate lands; however, development on state and private lands would likely occur. The area of surface disturbance would be less than half as much as the Proposed Action. Impacts to listed threatened and endangered species would be the same as for the Proposed Action except that there would be only 1 well and about 1 mile of road within 1 mile of the 1996 peregrine falcon nest site, and 1 well within 0.5 mile of the Bull Point bald eagle winter roost.

Impacts from this alternative would be similar to those described for the Proposed Action. There would be less surface disturbance potentially conflicting with burrowing owl, loggerhead shrike, ferruginous hawk nests, and sensitive plant habitat. About 77 acres (0.5 percent) of shrike habitat would be directly affected during construction and 40 acres (0.2 percent) of shrike habitat occupied by aboveground facilities during the operational phase. Impacts to all other species would be the same as for the Proposed Action. Mitigations for this alternative would be the same as for the Proposed Action and the resulting impacts after application of mitigations and stipulations would be similar.

4.8.3 Impacts Summary

A comparison of the impacts of the Proposed Action and the seven alternatives is provided in Table 2.8-2. None of the alternatives are likely to adversely affect federally listed endangered or threatened species.

All alternatives could destroy or disturb burrowing owl, loggerhead shrike, and ferruginous hawk nests and have the potential to damage undocumented occurrences of sensitive plant species. On federal lands impacts to these species would be minor and non-significant, assuming the application of committed and proposed mitigation measures. BLM mitigation would not apply on state or private lands, and impacts may occur under all alternatives (including No Action) if nests or plants are located at facility locations.

4.8.4 Mitigation

The mitigations included in the Proposed Action and environmental protection measures would provide protection for endangered, threatened and sensitive species. In addition, the following mitigations should be required to reduce or avoid impacts:

- I. No construction should occur within 1 mile of an active peregrine falcon nesting during the nesting season (February 15 to July 15).
- II. If construction is planned during the breeding season in potential shrike or burrowing owl habitat, a site-specific search of the planned disturbance area should be conducted to determine the presence or absence of active nests. If present, construction on or immediately adjacent to nests should be avoided or delayed until the end of nesting. RGC

employees and contractors should report all observations of active burrowing owl nests to the BLM. Adverse impacts would be unlikely with

use of this mitigation.

III.

- IV. Prior to construction, botanical clearance surveys should be conducted in an appropriate season in all areas of potential habitat that would be directly affected, for all facilities. If previously undocumented occurrences of Creutzfeldt catseye or canyon sweetvetch are found, their occurrence should be reported and direct impacts avoided by minor realignment of facilities. If avoidance is not possible, appropriate mitigation should be developed in consultation with the BLM and other agencies.
- V. RGC should use screening on vent pipes at compressor stations to prevent bats from roosting in them.

4.8.5 Unavoidable Adverse Impacts

Unavoidable adverse impacts to threatened, endangered and sensitive species would be a loss of some foraging and nesting habitat (peregrine falcon, bald eagle, burrowing owl); and some increase in potential for vehicle related wildlife mortalities and injuries. There would be no unavoidable adverse impacts to sensitive plant species.

4.9 CULTURAL RESOURCES

4.9.1 Introduction

Cultural resources are highly sensitive to ground disturbance. Direct impacts to prehistoric and historic archaeological sites would occur from ground-disturbing activities associated with construction of CBM wells, compressor stations, other facilities, access roads, pipelines, and electrical lines. Most archaeological sites in the Project Area are shallow, and cultural deposits would be damaged or destroyed by vegetation clearing and blading or excavation of soils. Standing historic structures, because they are readily identifiable, are less likely to be subject to these types of impacts. The 12 historic buildings in Price and Spring Glen that are listed on the NRHP would not be directly impacted.

Cultural resources may also be subject to indirect impacts such as increased vandalism, artifact collection from the surface of sites, and illegal excavation of archaeological sites as a result of opening previously inaccessible areas to construction crew members and to the general public. Such indirect impacts pose a threat to cultural resources because those activities destroy the potential for recovery of significant scientific information regarding the past. Indirect impacts can also destroy the character of the site, making it worthless for future public enjoyment or education.

The Advisory Council on Historic

Preservation (ACHP) has set procedures (36 CFR 800) to be followed to determine the effect a project may have on significant cultural resources and how to mitigate that effect if it is determined to be adverse. The BLM, SHPO, ACHP, and RGC have prepared a Programmatic Agreement (PA) for cultural resources that stipulates how significant cultural resources are to be treated, including site avoidance or protection measures and mitigation of adverse effects. The PA will serve as the official compliance document and will be referenced in the ROD for the overall project.

When no sites or properties eligible to or listed on the NRHP are located in the APE, the Proposed Action can be determined to have “No Historic Properties,” and the action can be allowed to proceed with no further archaeological work. If any site(s) currently on or eligible for nomination to the NRHP is present in the Area of Potential Effects (APE), steps must be taken to avoid adverse impacts to the cultural property. An action is considered to have an adverse effect when it may diminish the integrity of the significant property’s location, design, setting, materials, workmanship, feeling or association. Adverse effects include but are not limited to:

1. Physical destruction, damage, or alteration of all or part of the property
2. Isolation of the property from or alteration of the character of the property’s setting, when the character contributes to the property’s eligibility to the National Register

3. Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting
4. Neglect of a property resulting in its deterioration and destruction
5. Transfer, lease, or sale of the property

For most archaeological sites, the first effect is of the greatest concern. Effects 2 through 4 are more likely to adversely affect historic structural sites or rural historic landscapes. All five effects, however, would probably be considered adverse impacts to traditional cultural properties significant to Native Americans.

Effects of an undertaking that would otherwise be found to be adverse may be considered as being not adverse when the historic property is of value for its potential contribution to archaeological, historical, or architectural research (i.e., criterion 36 CFR 60.4 [d] only), and when its significant values can be substantially preserved through research or archaeological data recovery efforts conducted in accordance with applicable professional standards and guidelines. The Environmental Protection Measures identified in Section 2.2.5 implement measures to: identify, evaluate, and treat historic properties (BLM42); consult with Native American groups regarding traditional cultural properties (BLM43); evaluate and treat historic properties encountered during construction or operation (BLM44); and deal with human remains encountered on federal lands (BLM44). The UDWR and SITLA Lands both also require cultural/historic surveys of areas affected by land-disturbing operations. Environmental protection measure RGC 18 further specifies that RGC would educate its work crews to not collect, excavate, or otherwise disturb cultural resource materials found within or near the Project Area. These measures would protect significant cultural

resources in the Project Area from many adverse impacts resulting from the Proposed Action or any of the alternatives.

Direct disturbance or destruction of significant cultural resource sites would take place within any areas subject to direct disturbance from development. Direct impacts would occur during the construction and drilling phase of the project. Additional direct impacts to cultural resources are not anticipated during the production phase or during the final reclamation and abandonment phase, providing that ground disturbance associated with those actions is

restricted to the APE, as defined below. The acreage calculations for direct impacts under the Proposed Action and each alternative (Table 4.9-1) include the proposed short-term disturbance areas for transportation corridors plus the proposed disturbance areas for compressor stations, evaporation ponds, injection wells, and proposed wells. Existing facilities are not included in the totals. Significant cultural resources are expected in the high and medium sensitivity zones.

Because the cultural resource inventory would not be conducted until after the EIS is complete, the numbers and types of significant sites within the Proposed Action and each alternative are presently unknown. Acres of direct disturbance have been used to quantify the potential direct impacts to cultural resources.

The APE is larger than the direct impact area and judged to be the area within which indirect loss of important cultural materials due to private collection or vandalism may occur, or where there may be direct or indirect disturbance or destruction of important Native American religious or culturally significant sites. The APE for cultural resources is of variable size, depending upon the projected levels of sensitivity for cultural resources identified in Section 3.9.2 (Table 4.9-2). In low sensitivity areas, the APE is defined as the direct impact areas only and a 100-foot-wide corridor centered along transportation routes. In medium sensitivity areas, the APE is defined as the actual disturbance area plus an additional 75 feet along each side or a minimum of 10 acres surrounding wells and other CBM facilities, whichever is larger, and a 150-foot-wide corridor centered on all transportation routes. In high sensitivity areas, the APE is defined as the actual disturbance area plus an additional 150 feet along each side or a minimum of 10 acres surrounding well locations and other CBM facilities, whichever is larger, and a 300-foot-wide corridor centered on all transportation routes. The total APE acreage figures within each sensitivity zone (Table 4.9-3) have been used to quantify the potential secondary disturbance to cultural resources.

4.9.2 Direct and Indirect Impacts

4.9.2.1 Proposed Action

The Proposed Action would result in ground disturbance and potential direct impacts to significant cultural resources throughout the Project Area. Acres disturbed during construction amount to 1,613 acres of the high sensitivity zone (1.9 percent of the total), 1,985 acres of the medium sensitivity zone (2.4 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total) (Table 4.9-1). The APE for the Proposed Action, where indirect impacts resulting from increased access to cultural resources may result, includes 7,487 acres of high sensitivity (8.7 percent of the total), 6,168 acres of medium sensitivity (7.5 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total) (Table 4.9-3). Significant cultural resources are not expected to be present in the low sensitivity zone. Cultural resource inventories of 14,259 acres would be required for the Proposed Action.

4.9.2.2 Alternative A

Alternative A would result in more ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would occur throughout the Project Area. Acres disturbed during construction of Alternative A (Table 4.9-1) amount to 2,109 acres of the high sensitivity zone (2.4 percent of the total), 2,754 acres of the medium sensitivity zone (3.3 percent of the total), and 897 acres of the low sensitivity zone (4.6 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative A (Table 4.9-3) includes 10,327 acres of high sensitivity (11.9 percent of the total), 9,571 acres of medium sensitivity (11.7 percent of the total), and

1,106 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 21,004 acres would be required for Alternative A.

4.9.2.3 Alternative B1

Alternative B1 would result in less ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would be restricted to a smaller geographic area. Acres disturbed during construction of Alternative B1 (Table 4.9-1) amount to 1,216 acres of the high sensitivity zone (1.4 percent of the total), 1,439 acres of the medium sensitivity zone (1.8 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative B1 (Table 4.9-3) includes 5,263 acres of high sensitivity (6.1 percent of the total), 4,321 acres of medium sensitivity (5.3 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total). Cultural resource inventories of 10,187 acres would be required for Alternative B1.

4.9.2.4 Alternative B2

Alternative B2 would result in ground disturbance and potential direct impacts to significant cultural resources within a smaller geographic area than the Proposed Action. Acres disturbed during construction (Table 4.9-1) amount to 1,625 acres of the high sensitivity zone (1.9 percent of the total), 2,008 acres of the medium sensitivity zone (2.4 percent of the total), and 875 acres of the low sensitivity zone (4.4 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative B2 (Table 4.9-3) includes 7,518 acres of high sensitivity (8.7 percent of the total), 6,709 acres of medium sensitivity (8.2 percent of the total), and 1,095 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 15,322 acres would be required for Alternative B2.

4.9.2.5 Alternative C1

Alternative C1 would result in less ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action. Impacts would also be restricted to smaller geographic area. Acres disturbed during construction (Table 4.9-1) amount to 1,389 acres of the high sensitivity zone (1.6 percent of the total), 1,894 acres of the medium sensitivity zone (2.3 percent of the total), and 496 acres of the low sensitivity zone (2.5 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative C1 (Table 4.9-3) includes 6,213 acres of high sensitivity (7.2 percent of the total), 5,825 acres of medium sensitivity (7.1 percent of the total), and 603 acres of low sensitivity (3.1 percent of the total). Cultural resource inventories of 12,642

acres would be required for Alternative C1.

4.9.2.6 Alternative C2

Alternative C2 would result in more ground disturbance and potential direct impacts to significant cultural resources than the Proposed Action, even though impacts would be restricted to a smaller geographic area. Acres disturbed during construction (Table 4.9-1) amount to 1,805 acres of the high sensitivity zone (2.1 percent of the total), 2,616 acres of the medium sensitivity zone (3.2 percent of the total), and 897 acres of the low sensitivity zone (4.6 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative C2 (Table 4.9-3) includes 8,648 acres of high sensitivity (10 percent of

the total), 9,035 acres of medium sensitivity (11 percent of the total), and 1,106 acres of low sensitivity (5.6 percent of the total). Cultural resource inventories of 18,789 acres would be required for Alternative C2.

4.9.2.7 Alternative D

Alternative D would result in less ground disturbance and fewer potential direct impacts to significant cultural resources than the Proposed Action. In addition, impacts would be restricted to a smaller geographic area. Acres disturbed during construction (Table 4.9-1) amount to 1,582 acres of the high sensitivity zone (1.8 percent of the total), 1,077,085 acres of the medium sensitivity zone (1.3 percent of the total), and 502,511 acres of the low sensitivity zone (2.56 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for Alternative D (Table 4.9-3) includes 4,236 acres of high sensitivity (4.9 percent of the total), 3,984,011 acres of medium sensitivity (4.9 percent of the total), and 301,310 acres of low sensitivity (1.6 percent of the total). Cultural resource inventories of 8,535,556 acres would be required for Alternative D.

4.9.2.8 No Action Alternative

The No Action alternative would still result in ground disturbance and potential direct impacts to significant cultural resources, principally from transportation corridors crossing federal lands. Acres disturbed during construction (Table 4.9-1) amount to 998 acres of the high sensitivity zone (1.2 percent of the total), 678 acres of the medium sensitivity zone (0.8 percent of the total), and 234 acres of the low sensitivity zone (1.2 percent of the total). Significant cultural resources are not expected to be present in the low sensitivity zone. The APE for the No Action alternative (Table 4.9-3) includes 4,355 acres of high sensitivity (5 percent of the total), 1,872 acres of medium sensitivity (2.3 percent of the total), and 261 acres of low sensitivity (1.3 percent of the total). Cultural resource inventories of 6,488 acres would be required for the No Action alternative.

4.9.3 Impacts Summary

Construction of any of the alternatives would result in direct and indirect impacts to significant cultural resources, with the greatest impacts to cultural resources expected under Alternative A (Table 2.8-2). Direct and indirect impacts to significant cultural resources would be mitigated through implementation of a PA, which includes the Environmental Protection Measures presented in Section 2 and the additional mitigation measures proposed in Section 4.9.4, below. The implementation of these measures should result in an overall increase in knowledge regarding prehistoric and historic occupation of the Project Area because of the large-scale cultural resource studies that would be an outcome of project development.

4.9.4 Mitigation

In addition to the implementation of the Environmental Protection Measures outlined in Section 2, potential adverse effects to significant cultural resources resulting from direct or indirect project impacts would be mitigated through the development and implementation of a Cultural Resources Management Plan (CRMP). RGC, in consultation with the BLM, would develop the CRMP prior to any additional construction activities by RGC. The CRMP would address the potential effects of the entire project on historic properties. The CRMP would identify all known historic properties in the APE and probable site types that may be located, the nature of the effects to which each property would be subjected, and the treatment strategies proposed to minimize or mitigate the effects of the undertaking. The CRMP would include, at a minimum, the following elements:

- A research design that addresses important questions for the key periods of occupation or traditions represented in the sites in the Project Area.
- Suggested means of informing the public of the research in a manner that does not endanger the resource.
- Procedures for consulting with any interested persons or affected Indian tribes on issues that may involve historic properties.
- The means by which sensitive information concerning historic properties would be kept confidential.
- The means by which RGC would educate work crews as to the sensitivity of cultural resources, the

protection they are afforded, and their responsibilities to avoid disturbance to sites and to report any discoveries during construction activities.

- Procedures for addressing previously unknown properties encountered during construction.
- Procedures for addressing the discovery of human remains, including consultation with federal and state officials and the appropriate American Indian Groups.

The CRMP would include provisions for determining potential effects on previously recorded historic properties located within the APE of the proposed project or properties located by the identification and evaluation activities undertaken as part of the project. The CRMP would address the potential indirect impacts to historic properties located in the APE and would address possible mitigation measures including, but not limited to, public and work crew education, increased on-site presence by local interested groups or citizens, monitoring during construction, site review at scheduled intervals, data standards, data recovery, and a summary at the end of the project. The CRMP would also address the option of allowing public access to a site after appropriate studies have been conducted. The BLM, RGC, and the SHPO would work together to determine the most feasible means of mitigating potential indirect impact.

The CRMP would address means of mitigating impacts to traditional cultural properties, if any are identified in the APE. These means may include time use restrictions, landscaping and replanting, project or site blessing, and relocation of project elements. American Indian groups would be consulted to determine

appropriate mitigation measures.

4.9.5 Unavoidable Adverse Impacts

Most adverse effects to cultural resources would be mitigated. It is possible, however, that inadvertent destruction of some cultural resources may occur. In addition, archaeological data recovery (excavation) of a cultural resource site is an irretrievable commitment of a non-renewable resource. Because significant archaeological sites that cannot be avoided would be managed for their information potential, the number of historic properties in the Project Area available for conservation management may be reduced. Data recovery may also lessen or destroy a

site's public value, making it worthless for public education as an archaeological interpretive site. This is particularly the case when data recovery is being conducted so that project development can take place. Depending on the size of the property and the values which render it significant, some archaeological sites are completely destroyed during the mitigation/data recovery process. Additionally, the surface-disturbing impacts which set the data recovery process in motion may complete the destruction process with some types and sizes of properties. Furthermore, current archaeological techniques do not recover and analyze all data contained on a site. Even though the curated data collected from the excavations would still be available for additional research, any cultural resources destroyed now through excavation and/or construction would, themselves, no longer be available for study when new archaeological techniques are employed in the future.

4.10 LAND USE

4.10.1 Introduction

The following types of land use impacts are discussed in this section of the EIS:

- I. Direct removal or loss of lands currently used for agriculture and industrial uses during the life of the project. Direct impacts to existing land uses could occur in areas required for roads, production wells, pipelines, compressor stations, and injection wells. These would be short or long-term impacts.
- II. Direct impacts to land use operations due to the presence of project facilities, such as changes to agricultural operations. Operational impacts would be long-term effects.
 - a) Conflicts with rural residential and community areas due to the presence of truck traffic, dust, noise and visual impacts. Project facilities and activities may create impacts to other existing or planned uses due to secondary effects of increased dust, traffic, noise, and visual changes. The proximity of the project facilities to residential, recreational or public community uses and the presence or absence of topographic barriers would largely determine the degree to which land use incompatibility effects occur. These impacts may be short or long-term.
- III. Nonconformity with adopted plans and policies of federal, state and local agencies. Consistency with land use plans and regulations is evaluated in accordance with the adopted plans, policies, guidelines, and regulations of federal, state, and local agencies.
- IV. Impacts associated with project-related vehicle traffic on Project Area highways and local roads. Vehicle trips associated with the proposed project include worker commute trips, well maintenance/workover trips, and trucks hauling construction materials and other supplies to the CBM development area. Transportation impacts would be described in the context of current

traffic on Project Area roads and the capacity of those roads to handle the additional project-related traffic.

- V. Impacts of project-related using county roads for access to the CBM development area and the potential cost to the county road special service districts.

Recreation and grazing issues are discussed in Sections 4.11 and 4.12, respectively.

Significance Criteria

Impacts to land uses are considered potentially significant and unmitigable if the project directly impacts residential or agricultural areas with split estate mineral/surface ownership and the surface owner is not able to negotiate a satisfactory surface use plan.

Impacts to land uses are considered potentially significant, and mitigable, if the project impacts residential or agricultural areas with surface and subsurface land ownership. Landowner agreements would be secured in this setting to the satisfaction of the landowner and RGC. In these areas, landowners would negotiate agreements and compensation with RGC regarding the placement, construction, and operation of CBM facilities.

Impacts to residential areas would be significant and potentially unmitigable where the CBM wells are located on private or state mineral estate lands within 500 feet of a rural residence due to the land use incompatibility of rural residential uses with the industrial noise, traffic, dust, safety hazards, and visual effects of CBM facilities.

Impacts to residential areas may be significant where the CBM wells are located within 0.5

mile of a rural residence with unobstructed views to the proposed facilities due to the land use incompatibility of rural residential uses with the industrial noise, traffic, dust, and visual effects of CBM facilities.

Land use compatibility impacts to residential areas may vary from significant to slightly adverse in areas where the CBM facilities are located within a middleground distance zone (0.5 to 4.0 miles). Degree of impact would vary depending upon distance, topographic, and vegetation conditions, as well as the number and type of facilities that would be constructed and operated and maintained.

Impacts to planned land uses would be significant if the project directly conflicts with the management goals and objectives of the Carbon County and Emery County general plans and Carbon County Trails Plan. Impacts to the Gordon Creek Wildlife Management Area would be significant if the project substantially diminishes the resource values for which the management area was established to conserve. With respect to transportation, impacts associated with project-related traffic on highways and local roads would be significant if project-related traffic were to exceed the actual traffic capacity of those roads. Impacts on county road districts associated with increased maintenance costs would be significant if the increase in maintenance costs were to exceed payments or royalties received by those districts from the project.

Environmental Protection Measures

Environmental protection measures that would be followed to reduce land use-related impacts

include RGC 1, RGC 4, RGC 6, RGC 7, RGC 10, RGC 12, RGC 13, BLM 46, and BLM 47.

4.10.2 Direct and Indirect Impacts

4.10.2.1 Proposed Action

Land Status and Administration

Lands under the jurisdiction of the BLM and State of Utah, and private lands of Carbon and Emery counties, are shown according to surface status on Plate 1. Table 2.2-1 lists the acres of short-term and long-term disturbance by each facility type and ownership/administration that would occur from the Proposed Action. The Proposed Action would affect approximately 2,211 acres of BLM lands, 334 acres of UDWR lands, 616 acres of the State Trust lands, and 934 acres of private lands.

Agriculture

The Proposed Action would have short-term (construction) impacts on approximately 198 acres of irrigated agriculture during construction, and long-term (operation) effects on 120 acres. Table 4.10-1 identifies the short-term and long-term impacts to irrigated agriculture by alternative. Impacts to agriculture would include the permanent loss of land from production, reduced productivity in construction areas due to soil compaction from heavy equipment operations, and modifications to equipment operations. Overall, the project would have direct, long-term impacts on approximately 1.1 percent of the irrigated agriculture in the Project Area. Approximately 7 acres of agricultural land may be significantly impacted short-term in split-estate surface/subsurface ownership areas. Long-term impacts to agricultural land in these areas is estimated at 3 acres. The Proposed Action would require approximately 49 acre-feet of water per year. The source of this water would vary, however, some water would be withdrawn from the Carbon Canal. Assuming that the 49 ac-ft/yr would be water formerly used for irrigation of agricultural lands, approximately 11 acres of irrigated land would be impacted by the project. That represents about 0.07 percent of the total irrigated agricultural land in the Project Area.

Residential and Community Uses

The Price CBM Project would avoid physically impacting the communities of Price, Carbonville, Spring Glen, Wellington, and Elmo due to the distance between the proposed facilities and these towns. Land use incompatibility impacts would result from increased noise, dust, traffic, and visual changes where the CBM facilities and activities are within foreground (up to 0.5 mile) to middleground distances (up to 4 miles) of existing residential land uses. These types of direct impacts to residents would primarily occur west and south of Price, northwest of Price along Gordon Creek Road, and west of Elmo, where the project facilities would be located in dispersed residential/agricultural areas.

Table 4.10-2 shows the number of residences that may be affected by CBM development within certain distances of proposed wellsites. In the 160-acre well spacing scenario (Proposed Action, Alternatives B1, C1, and D), there would be 59 homes within 500 feet of well sites; 273 residences within one-quarter mile of well sites; and 505 residences within one-half mile of proposed wells. In the 80-acre well spacing scenario (Alternatives A, B2, C2), there would be 76 residences within 500 feet of proposed wells, 300 residences within one-quarter mile of proposed wells, and 513 residences within one-half mile of proposed wells. The No Action alternative scenario has wells being drilled only on state and private lands with a 160-acre well spacing. For the No Action, there would be 46 residences within 500 feet, 248 residences within one-quarter mile, and 483 residences within one-half mile of proposed wells. As shown in Table 4.10-2,

there is not a significant difference in the number of residences within the buffer zones of proposed wells in the different alternatives, including the No Action alternative. This is due to the fact that most alternatives differ from each other in the location and amount of land excluded from CBM development due to wildlife concerns. These lands are located mostly in the western part of the Project Area away from residential development. Residential development generally occurs in the eastern part of the Project Area near existing towns where the majority of the land is either private or state owned. CBM development can occur on state and private land without any approval of the BLM (where the subsurface minerals ownership is also non-federal). Table 4.10-3 shows how many residences may be affected by CBM development occurring exclusively on federal land.

Where CBM facilities are located in the proximity of residences, truck traffic from construction and operation activities could pose increased safety hazards to children and pedestrians. Hazards to residents would also be created by construction activities and equipment, including drilling rigs, road graders, etc., and by production well operations. These impacts are considered significant and mitigable in areas directly affected where private landowners control both surface and subsurface minerals and, therefore, can negotiate lease terms with RGC as necessary. In total, the Proposed Action would physically affect 13 acres of residential lands during construction and 8 acres long-term. Direct impacts to split estate lands are considered potentially unmitigable due to the restricted rights of landowners and the non-binding nature of

suggested mitigation measures described therein. These types of physical impacts would potentially occur on two acres of land proposed for CBM facilities.

Consistency with Land Use Plans and Controls

The Proposed Action is consistent with the existing PRRA MFP (USDI, BLM 1984a), and subsequent Environmental Assessment Supplement on Cumulative Impacts on Oil and Gas Categories (USDI, BLM 1988a). All operations proposed by RGC would be conducted in full compliance with the terms and conditions of the MFP and federal and state lease stipulations.

Conflicts with potential mining activities are not anticipated. The coals within the Project Area are currently uneconomical to mine, due to both depth and current pricing structures for subbituminous coals. In addition, the removal of methane and water from the coalbeds may be beneficial to the mine lessee, should mining become feasible in the future.

The Proposed Action would be consistent with the State of Utah's policies regarding state trust lands, which are aimed at obtaining the greatest possible monetary return for the trust consistent with sound management practices, and managing trust lands for their highest and best use.

The Proposed Action would not be consistent with the overall purpose and management objectives of the Gordon Creek Wildlife Management Area land management plan. The management goals of the plan include habitat, wildlife, and recreation elements, with emphasis on achieving and maintaining optimum population levels for deer, elk, and moose. Under the Proposed Action, wells and roads

would be located throughout the wildlife management area, and would have significant impacts to wildlife (Section 4.7). UDWR would require mitigation for both direct and indirect impacts as described in Section 2.2.5.3. UDWR has expressed a concern that drilling on these lands which were acquired with funds from the USFWS under the Pitman-Robertson Act, may represent a diversion of these lands from the purposes for which they were acquired, which could jeopardize further federal aid dollars.

The recently approved Carbon County Comprehensive Plan contains goals, objectives, and strategies for a number of different issues important to the county, ranging from business development to recreational opportunities. The Proposed Action and the alternatives vary in consistency and relevancy with the various plan components. Generally, the CBM development would be compatible with many of the economic and business development goals of the county, including business expansion and retention. Other policies and goals, particularly those dealing with retention of the county's rural and scenic qualities, fee collection from commercial/industrial users of county roads, 100 percent bonding based on estimated reclamation costs, and development of a county trails system may not be met to varying degrees by the proposed project. The Carbon County Trails Plan is included in the comprehensive plan as an appendix. Several of the trails in the proposed trail system would be used by CBM construction and maintenance vehicles, and would also be in the viewshed of project facilities. The recreation section (4.12) gives further detail on impacted trails.

In Carbon County oil and gas development is allowed, with the necessary permits, in all land use zoning categories except for the CE-1 zone. In CE-1 areas, RGC must request a zoning

change to CE-2 and also receive a conditional use permit. A conditional use permit is also required for any well development in areas zoned as residential. In Emery County, gas wells are allowed in all land use zoning categories that are present within the EIS study area. However, RGC must apply for a conditional use permit for all proposed wells regardless of the zoning classification. In both counties, the process for the county to grant RGC a conditional use permit requires a review of the proposed site plans by county planning commissions and the County Commissioners, and also requires a public hearing where the public has an opportunity to voice specific concerns about the development plans. As long as RGC complies with the permitting process of the counties, the Proposed Action would be consistent with zoning regulations of the Counties.

Transportation

Project-related traffic would consist of both worker commute trips from their homes to the active portion of the CBM development area, and truck trips associated with the hauling of various materials and supplies. For the Proposed Action, it is estimated that there would be a maximum of 120 commuter round trips per day during the active construction period from May to November. It is assumed that many project workers would ride together and use pickup trucks and other four wheel drive vehicles to commute to the active part of the project site. Workers would not be shuttled by RGC to the project site by bus or other types of high occupancy vehicles (e.g., van). In addition, approximately 110 truck trips per day would occur during the height of the construction season.

As a part of routine CBM field operation and maintenance, each CBM well would receive a maintenance visit about once every three days. Generally, crews average about two wells per trip. It is estimated that a maximum of 100 truck trips per day would occur at project peak, when all 601 of the proposed CBM wells would be in operation. It is important to note that the 100 maintenance trips per day would be distributed throughout the development area, rather than concentrated in a specific area, as would be the case for the construction phase trips. Over time, as CBM wells would go out of production, the number of daily maintenance trips would also decline in the Project Area.

Since there would be an overlap between the construction and operations phases, the total volume of traffic in the Project Area could be

as high as 330 trips per day at project peak (230 construction trips plus 100 maintenance trips).

Based on review of current traffic data on Project Area highways and roads, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. Relative to pre-project conditions, traffic volumes could increase by approximately 6.9% on U.S. Highway 6, 13% on State Route 10, and about 32% on State Route 122 during the May to November construction season. The reason for the large increase in traffic volume on State Route 122 is the low traffic volumes experienced on that road at present. Impacts to particular portions of these highways would vary from year to year because of the phased nature of the proposed CBM development. Each portion of highway in the overall Project Area would be impacted for part of the 10 year construction phase. For example, development in the vicinity of State Route 122 would occur in Years 1 - 4, but not in Years 5 - 9 (Plate 3). Given that these highways all operate well below their capacity at present, these projected traffic increases would not significantly increase traffic congestion or accident rates in the Project Area. In some locations, trucks could cause minor traffic delays, but this type of impact would be sporadic and less than significant.

As described in Section 3.10.7, historic traffic counts were not available from the Carbon County Road Department for county maintained

roads in the Project Area. However, the county has stated that pre-project traffic volumes were quite low due to the sparse population of the areas they serve. For impact assessment purposes, the County Road District has estimated that vehicle traffic would probably triple under the Proposed Action, compared with historic levels. This would represent a significant increase in traffic volumes, although they would remain substantially below the capacity of the local roads to handle them. According to the Transportation Research Board's Highway Capacity Manual, the County maintained gravel roads that serve the CBM development area have a capacity of up to 2,850 vehicles per day. Even if the project were to triple the traffic volume on those roads, the 330 trips per day maximum generated by the project would be well below this capacity. This increase in traffic on local roads would increase dust and air pollutant emissions, increase noise, and increase county road maintenance costs. Potential traffic-related impacts to air quality are addressed in Section 4.3. Impacts associated with vehicle noise are addressed in Section 4.14, and impacts on county road maintenance costs are addressed below and in Section 4.15 in more detail.

Carpooling or other forms of ridesharing would reduce the number of commuter vehicle trips on Project Area highways and roads. RGC has encouraged ridesharing where feasible. However, RGC has not formally

proposed ridesharing as a mitigation measure to reduce traffic because of the disbursed nature of CBM field construction activities. While drill rig crews who work together at the same site all day can rideshare effectively, other construction workers often have assignments that send them to various locations in the field over the course of the day and ridesharing is not practical.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. In Carbon County, the government agency that has responsibility for building, improving, and maintaining these roads is the Carbon County Roads Special Service District. RGC would need to obtain a Road Use Permit for transporting heavy equipment and materials on Carbon County Roads, and a Road Opening Permit for intersecting a project road or pipeline with a county road. In Emery County, the responsibility for roads rests with the Emery County Special Service District #1. RGC would need to obtain a Roadway Encroachment Permit for any disturbance such as upgrading, constructing, realigning, or obstructing a county roadway or ROW.

Although future project activities would increase the need for maintenance on county roads, and that maintenance may increase costs borne by the two county road districts, considerable mineral lease royalty payments would be made by RGC that would be allocated to those districts. Section 4.15 discusses increased county road maintenance costs and future royalty payments that would be paid to the county road districts.

4.10.2.2 Alternative A

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.3-1. Alternative A would affect approximately 3,048 acres of BLM lands, 1,413 acres of State land, and 1,285 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of Alternative A. Total short-term and long-term impacts to agriculture are estimated to be 298 and 193 acres, respectively. Potentially significant impacts on split estate agricultural lands include approximately 12 acres disturbed during construction and 7 acres lost during the life of the project. Impact issues are the same as described previously for the Proposed Action. Overall, Alternative A would have a direct, long-term impact on approximately 1.7 percent of the agricultural land within the Project Area. Additionally, another 19 acres of irrigated land may be impacted due to a change in water use from agriculture to industry.

Residential and Community Uses

Impacts to residential and community areas would be similar to those described for the Proposed Action. Alternative A would have a greater impact on rural residential areas due to the increased density of wells (i.e., 80-acre

versus 160-acre well spacing), as compared to the Proposed Action. In total, Alternative A would physically affect 18 acres of residential lands during construction, and 12 acres during the life of the project.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state, and local plans would be similar as described for the Proposed Action. The increased density of wells for Alternative A would result in greater conflicts with the Gordon Creek Wildlife Management Area goals and objectives.

Transportation

Since this alternative would substantially increase the number of CBM wells and associated roads, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative A, up to 212 commuter round trips per day are projected during the active construction period. In addition, approximately 160 truck trips per day would occur during the height of the construction season. For routine maintenance of producing CBM wells (workovers), up to 184 truck trips per day could occur at project peak. In total, about 556 trips per day could occur at project peak (372 construction trips plus 184 maintenance trips). Despite this increase in traffic relative to the Proposed Action, review of current traffic data on Project Area highways and roads show that these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This substantially more intensive project alternative would likely increase the severity of road wear impacts and increase maintenance costs to the county road

districts. Considerable mineral lease royalty payments would be made by RGC that would be allocated to those districts. These royalties would be even greater than described for the Proposed Action due to increased gas production. Based on projected royalty payments, it is estimated that project-related royalty revenue would vastly exceed any increased costs that would be borne by the road districts for maintaining impacted county roads. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.3 Alternative B1

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.4-1. Alternative B1 would affect approximately 1,401 acres of BLM lands, 262 acres of UDWR lands, 589 acres of the State Trust land, and 889 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Impacts to agriculture would generally be the same as for the Proposed Action. See Table 4.10-1 for acres of direct impacts. Seven acres of irrigated agricultural land may be impacted due to the change in water use.

Residential and Community Uses

Impacts to residential and community areas would be the same as described for the Proposed Action. Alternative B1 would have

similar impacts on rural residential areas as the Proposed Action.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state, and local plans would be similar to the Proposed Action. This alternative would impact less acreage of the Gordon Creek Wildlife Management Area, resulting in fewer conflicts with the management goals of this designated area. There would be no development in the southeastern and south-central portions of the area, but wells would be placed in several security areas.

Transportation

This alternative would decrease the number of CBM wells and associated roads by about 30 percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be smaller than described for the Proposed Action. For the Alternative B1, about 90 commuter round trips per day are projected during the active construction period. In addition, approximately 75 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 73 truck trips per day could occur at project peak. In total, about 238 trips per day could occur at project peak (165 construction trips plus 73 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project

alternative would likely result in less road wear impacts and maintenance costs to the county road districts, relative to the Proposed Action. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.4 Alternative B2

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.4-3. Alternative B2 would affect approximately 1,933 acres of BLM lands, 318 acres of UDWR lands, 996 acres of State Trust lands, and 1,239 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Impacts to agriculture would generally be the same as for Alternative A. See Table 4.10-1 for acres of direct impacts. Fourteen acres of irrigated land may also be impacted due to a change in water use.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as described for the Proposed Action. Alternative B2 would have a greater impact on rural residential areas due to the increased density of wells (i.e., 80 acre versus 160 acre well spacing), as compared to the Proposed Action

and Alternative B1.

Consistency with Land Use Plans and Controls

The consistency of this alternative with federal, state and local plans would be similar to

Alternative A, except for the Gordon Creek Wildlife Management Area, with which Alternative B2 would conflict less. There would be no development in the southeastern or south-central portions of the area, but wells would be placed in several security areas.

Transportation

Since this alternative would increase the number of CBM wells and associated roads by approximately 18 percent, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative B2, about 160 commuter round trips per day are projected during the active construction period. In addition, approximately 130 truck trips per day would occur during the height of the construction season.

For routine maintenance/workovers of producing CBM wells, up to 139 truck trips per day could occur at project peak. In total, about 429 trips per day could occur at project peak (290 construction trips plus 139 maintenance trips). Despite this increase in traffic relative to the Proposed Action, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This more intensive project alternative would likely increase the severity of road wear impacts for the areas developed and increase maintenance costs to the county road districts. Mineral lease royalty payments that would be made by RGC and allocated to the

county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.5 Alternative C1

Land Status and Administration

Short-term and long-term disturbances to BLM, state, and private lands are summarized on Table 2.5-1. Alternative C1 would impact approximately 2,018 acres of BLM lands, 230 acres of UDWR lands, 617 acres of State Trust lands, and 913 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of Alternative C1. Total short-term and long-term impacts to agriculture are estimated to be 195 acres and 118 acres, respectively. Potentially significant impacts to split-estate agriculture lands include 7 acres during construction and 3 acres long-term. Impact issues are the same as described previously for the Proposed Action. Alternative C1 would affect approximately 1.0 percent of the agriculture in the Project Area. An additional 11 acres may be impacted due to a change in water use.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as

described for the Proposed Action. Table 4.10-1 shows acres impacted.

Consistency with Land Use Plans and Controls

The consistency of Alternative C1 with federal, state, and local plans would be similar to the Proposed Action. This alternative would present fewer conflicts with the wildlife management goals and objectives of the Gordon Creek Wildlife Management Area since big game security areas on both federal and UDWR lands would be avoided. This is discussed in further detail in Section 4.7.

Transportation

This alternative would decrease the number of CBM wells and associated roads by about eight percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be smaller than described for the Proposed Action. For Alternative C1, 110 commuter round trips per day are projected during the active construction period. In addition, approximately 95 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 92 truck trips per day could occur at project peak. In total, about 297 trips per day could occur at project peak (205 construction trips plus 92 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts and maintenance costs to the county road districts, relative to the Proposed Action. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be

borne by those districts for maintaining impacted county roads. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.6 Alternative C2

Land Status and Administration

Short-term and long-term disturbances to BLM, state, and private lands are summarized on Table 2.5-3. Alternative C2 would impact approximately 2,787 acres of BLM lands, 280 acres of UDWR lands, 1,003 acres of State Trust lands, and 1,248 acres of private lands. Permitting and regulatory requirements associated with the various agencies is the same as described for the Proposed Action.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of Alternative C2. Total short-term and long-term impacts to agriculture are estimated to be 295 acres and 191 acres, respectively. Potentially significant impacts to split-estate agriculture lands include 12 acres during construction and 7 acres long-term. Impact issues are the same as described previously for the Proposed Action. Alternative C2 would affect approximately 1.7 percent of

the agricultural land in the Project Area. An additional 17 acres may be impacted due to a change in water use from agriculture to industry. Comparatively, this alternative would have greater impacts than the Proposed Action or Alternatives A, B1 or C1, due to the 80 acre well spacing of Alternative C2.

Residential and Community Uses

The types of impacts to residential and community areas would be the same as

described for the Proposed Action. Overall impacts would be more intense in residential areas, due to the 80-acre well spacing allowed by Alternative C2.

Consistency with Land Use Plans and Controls

The consistency of Alternative C2 with federal, state, and local plans would be similar to the Proposed Action. This alternative would present fewer conflicts with the wildlife management goals and objectives of the Gordon Creek Wildlife Management Area, since big game security areas on both federal and UDWR lands would be avoided.

Transportation

Since this alternative would increase the number of CBM wells and associated roads by approximately 69 percent, impacts to the transportation system would be greater than described for the Proposed Action. For Alternative C2, approximately 195 commuter round trips per day are projected during the active construction period. In addition, approximately 150 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 168 truck trips per day could occur at project peak. In total, about 513 trips per day could occur at project peak (345 construction trips plus 168 maintenance trips). Despite this increase in traffic relative to the Proposed Action, these project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network. In some locations, trucks could cause minor traffic delays, but this type of impact would be less than significant.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This more intensive project alternative would likely increase the severity of road wear impacts for the areas developed and increase maintenance costs to the county road districts. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads, however. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.7 Alternative D

Land Status and Administration

Short-term and long-term disturbances to BLM, state and private lands are summarized in Table 2.6-1. Alternative D would directly impact 2,213 acres of BLM lands, 7 acres of UDWR lands, 590 acres of State Trust lands, and 902 acres of private lands. Under this alternative, which was developed for protection of big game habitat, CBM activity on UDWR lands in the Gordon Creek Wildlife Management Area would be limited.

Agriculture

The types of potential impacts and issues are the same as the Proposed Action. Table 4.10-1 identifies the short and long term impacts to agricultural lands that would result from implementation of Alternative D. Approximately 195 acres would be directly impacted during construction, and approximately 118 acres would be impacted in the long-term during the operation phase of the proposed project. Split-estate agricultural lands include 7 acres during construction and 3 acres during operations. About 1.0 percent of the agricultural lands within the Project Area would be impacted in the long-term in

this alternative. The potential loss of irrigated land due to a change in water use from agriculture to industry would effect an additional 11 acres.

Residential and Community Uses

Issues and types of potential impacts are the same as the Proposed Action. This alternative is similar in the intensity of potential impacts to residential areas as the Proposed Action, and other alternatives with 160-acre well spacing (Alternatives B1, C1, No Action). Table 4.10-1 lists direct impacts to existing residential areas. Table 4.10-2 list the number of residences within 500 feet, one-quarter mile and one-half mile of proposed wells.

Consistency with Land Use Plans and Controls

The consistency of Alternative D to federal, state and local land use plans is similar to the Proposed Action. This alternative would impact less land within the Gordon Creek Wildlife Management Area, and consequently would present less of a conflict with the management goals of that area. The Consumers Wash/Pinnacle Peak trail, identified in the recreation section as one of the more popular loop drives in the Price area, and one of the trails identified in the Carbon County Trails Plan, would experience less impacts as a result of the reduced development in the Gordon Creek Wildlife Management Area. This would result in slightly less conflicts with the county's trails plan.

Transportation

This alternative would decrease the number of CBM wells and associated roads by about eight percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be smaller than described for the Proposed Action. For Alternative D, 110 commuter round trips per day are projected during the active construction period. In addition, approximately 95 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 92 truck trips per day could occur at project peak. In total, about 297 trips per day could occur at project peak (205 construction trips plus 92 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts and maintenance costs to the county road districts, relative to the Proposed Action. Mineral lease royalty payments that would be made by RGC and allocated to the county road districts would exceed costs that would be borne by those districts for maintaining impacted county roads. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.2.8 No Action Alternative

Land Status and Administration

Short-term and long-term disturbances to federal BLM, State of Utah, and private lands are summarized on Table 2.7-1. The No Action alternative would affect approximately 349 acres of BLM lands, 238 acres of UDWR land, 526 acres of State land, and 794 acres of private lands. Under this alternative, no additional BLM lands would be leased for production, however, ROWs would be granted for access to state and private lands.

Agriculture

Table 4.10-1 summarizes the short-term and long-term impacts to agriculture that would result from the implementation of the No Action alternative. Total short-term and long-term impacts to agriculture are estimated to be 171 and 109 acres, respectively. Potentially significant impacts during construction and operation to split-estate agricultural lands would be 3 acres and 2 acres, respectively. Impact issues are the same as described previously for the Proposed Action. Overall, the No Action alternative would impact approximately 1.0 percent of the agriculture within the Project Area. An additional 5 acres of agricultural land may be impacted due to a change in water use from agricultural to industrial use.

Residential and Community Uses

Impacts to residential and community areas would be similar to those previously described for the Proposed Action. The No Action alternative would have slightly less impacts on rural residential areas due to the decreased level of production that this alternative would permit.

Overall, significant impacts to residential and community land uses would still occur where CBM facilities are constructed within foreground distances of several residences due to increased noise, dust, traffic, and visual effects. These impacts would primarily occur northwest of Price, along Gordon Creek Road, west and south of Price and west of Elmo.

Consistency with Land Use Plans and Controls

Under this alternative, BLM lands would be used primarily for providing access to other private and state lands that would still be developed. No wells or other ancillary facilities would be constructed on BLM lands. The consistency of the No Action alternative would be similar to the Proposed Action. This alternative would impact less acreage of the Gordon Creek Wildlife Management Area. Although wells would be placed in several security areas, there would be little development in the southern half of the area.

Transportation

The No Action alternative would decrease the number of CBM wells and associated roads by about 62 percent, relative to the Proposed Action. Thus, impacts to the transportation system are projected to be considerably smaller than described for the Proposed Action. For the No Action alternative, about 50 commuter round trips per day are projected during the active construction period. In addition, approximately 50 truck trips per day would occur during the height of the construction season. For routine maintenance/workovers of producing CBM wells, up to 38 truck trips per day could occur at project peak. In total, about 138 trips per day could occur at project peak (100 construction trips plus 38 maintenance trips). These project-related trips are not expected to cause traffic volumes to exceed the capacity of the road network.

The increased use of county roads by project workers and trucks to access the CBM

development area would increase road maintenance costs. This less intensive project alternative would likely result in less road wear impacts, relative to the Proposed Action. As has been the case in the past, it is likely that RGC would maintain county roads accessing state and private lands under this alternative. Since very little federal lands would be developed under this alternative, minimal mineral lease royalty payments would be allocated to the county road districts. Section 4.15 addresses project-related road maintenance costs and mineral lease royalty payments to the county road districts.

4.10.3 Impact Summary

The impacts of the CBM alternatives on land use are summarized and compared by alternative in Table 2.8-2. Overall, each of the alternatives, including the No Action alternative, would directly impact agricultural land and be incompatible with existing rural residential areas. In addition, all the alternatives, including the No Action alternative, would have potentially significant impacts on residential and community areas that would lie within 0.5 mile of CBM construction and operations and related traffic, noise, dust, and visual effects. Depending on the setting (including topography, vegetation, and other land uses) and number of facilities built, significant incompatibility effects may extend beyond 0.5 mile. Impacts to agriculture and community/residential areas are considered potentially significant and unmitigable in areas of “split-estate” ownership (i.e., private surface and BLM or state subsurface mineral ownership). The greatest impacts would occur from Alternatives A, B2, and C2, which provide for 80-acre spacing of wells on private and state lands. Impacts for Alternatives B1, C1, and D would be very similar to the Proposed Action, while the No Action would have the least (but still potentially significant) impacts. The increased density of well sites, associated with Alternatives A, B2, and C2 would substantially increase the impacts to agricultural and grazing activities, when compared to the Proposed Action, Alternative B1, Alternative D, and the No Action alternative. These alternatives would also result in the greatest degree of land use incompatibility with residential uses that would be within 0.5 mile of project facilities or activities. The No Action alternative would also result in

significant conflicts with agriculture and commercial/residential areas. Because of the potential for gas royalties to generate more revenue than traditional agricultural or commercial uses, some landowners may desire well development on their property and look upon the CBM development as an opportunity for increased income.

All alternatives would conflict with the Carbon County Trails Plan and the Gordon Creek Wildlife Management Area Plan. Impacts would be reduced for Alternatives B1, B2, D, and the No Action alternative for conflicts with both plans. Alternatives C1 and C2 would have reduced conflicts with the Gordon Creek Wildlife Management Area Plan. Alternative D would have the least conflict with the Gordon Creek Wildlife Management Area Plan.

Although the Proposed Action and project alternatives would increase automobile and truck traffic on Project Area highways and roads, projected traffic volumes would not exceed the capacity of the transportation network. In general, for alternatives that would include development on federal lands, mineral lease royalty payment would exceed increased road maintenance costs that would be borne by the county road districts. RGC would maintain the roads that they construct.

4.10.4 Mitigation

The following additional mitigation recommendations would further reduce potential impacts to existing land uses and incompatibilities between the project activities and residential areas:

- I. Prior to construction, RGC should prepare an employee/contractors manual that describes the procedures that would be followed in the field to reduce conflicts with agricultural and grazing lands, residential areas, and other community uses. This manual should be made part of employee/contractor job descriptions/requirements. On private lands with “split estate” ownership, consultations with surface landowners should occur prior to final well design to discuss specific landowner concerns, such as potential effects to equipment operations, land use options, and land fragmentation. RGC should coordinate with the landowners to the degree possible to minimize impacts to surface use and long-term use options. Impacts may remain significant and unmitigable in “split estate” areas.

Project-related activities in residential areas should be avoided by using alternate roads, whenever possible. In residential areas that cannot be avoided, vehicular traffic should be kept to a minimum and truck/ vehicle speeds reduced to 15 to 20 mph. Adequate signage, including stop signs and signs identifying truck traffic should be installed on all local residential roads, as well as nearby highways.

4.10.5 Unavoidable Adverse Effects

Unavoidable adverse effects include long-term impacts to existing grazing and agricultural lands resulting from the permanent removal of land from these uses for CBM facilities. Unavoidable impacts would also include dust, noise, traffic, and visual effects from facility construction and operations to existing residential areas due to the presence of project facilities and activities. The industrial character of project activities and facilities would change the rural and undeveloped quality of life currently afforded in rural residential areas. Unavoidable effects are considered significant in agricultural and residential split-estate areas and in residential areas where CBM facilities would be on private and/or state lands within 0.5 mile.

4.11 LIVESTOCK MANAGEMENT

4.11.1 Introduction

The types of impacts that may be associated with the Price CBM Project include:

- I. Vegetation disturbance resulting in a reduction in the carrying capacity of the allotments. The construction of roads, wellpads, pipelines, evaporation ponds, compressor sites and other ancillary facilities would reduce the amount of forage available to livestock and cause an overall decrease in livestock production, as indicated by a loss in AUMs. Noxious weeds may be

introduced or spread in the allotments due to land disturbance which may provide an opportunity for weeds to establish themselves.

- II. An increase in vehicular traffic from the general public and from the construction and maintenance of roads, wellpads, and other facilities which may result in livestock management problems, and the effects of seasonal road closures on livestock operators access to the allotments.
- III.

IV. Effects to the management and control of livestock caused by the disturbance to range improvements such as fences, corrals, wells, springs, detention dams, water pipelines, and water tanks. Construction and maintenance of roads, wellpads, and other facilities would require crossing existing fencelines in most of the allotments, and would require crossing several water pipelines in two allotments.

Several environmental protection measures have been committed to by the RGC and/or required by the BLM which would reduce the potential impacts to livestock management. These measures are listed in Section 2.2.5. Measures that would apply to the grazing and range improvement resource include RGC 7, RGC 8, RGC 9, RGC 17, BLM 1, BLM 8 through 23 (reclamation measures), BLM 48 through 52 (livestock specific measures).

These protection measures are considered to be part of the project description and their implementation is assumed in the impact analysis. The measures address issues such as noxious weed control, the protection of livestock facilities, and access to grazing areas.

4.11.2 Direct and Direct Impacts

4.11.2.1 Proposed Action

Carrying Capacity

Disturbance due to the construction of roads, wellpads, and other facilities would result in a loss of available forage and a reduction in AUMs that the allotments currently support. Table 4.11-1 lists the acres of disturbance and the number of AUMs lost in each allotment for all alternatives. Approximately 2,126 acres of BLM land and 708 acres of state/private land within the allotments would be impacted during the construction phase, resulting in a loss of 146 and 48 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,243 acres of BLM land and 483 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 86 and 30 AUMs on BLM and state/private lands, respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 195 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 78 cattle or its equivalent being removed from the

Project Area. A total of 116 AUMs would be lost during the operational phase. This would equal 46 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than four cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Noxious weeds are discussed in Section 4.5. Due to the environmental protection measures and other regulatory controls that require strict control of the possible introduction or spread of noxious weeds, significant impacts from the spread of noxious weeds are unlikely.

Revegetation of disturbed areas is also addressed in Section 4.5. A seed mix for revegetation has been established by the BLM which would provide for forage production, among other criteria.

Traffic and Access

The construction and operation of the Price CBM project would result in an increase in traffic, both from the construction and operations traffic, and potentially from the public who may use some of the well field roads. Construction traffic, estimated to be about 230 daily trips, would be concentrated in the area being developed. Operational traffic, estimated to be about 100 daily trips, will be more spread out across the entire development area. Often, livestock may stand on, or walk across roads within the allotment. With the increase in traffic there would be more opportunity for collisions with livestock or for the livestock to be harassed by vehicles driving along the roads. In a study of effects of oil and gas operations on New Mexico ranch operations (Fowler and Witte 1985), increased vehicular activity was also believed to be responsible for decreases in calving percentage and calf market weight.

Increased vehicle traffic from the construction and operation phases, and from activities of the general public would deposit dust particles on the vegetation adjacent to the roads and well sites. This would lower the quality of the available forage for livestock in these confined areas. Increased traffic may also increase livestock management problems including gates being left open or torn down, watering and other improvements being vandalized, and harassment of livestock.

Protection measures call for livestock operators to maintain access to grazing areas at all times, regardless of seasonal road closures that may be implemented for wildlife or other resource concerns. Operators would be issued a key for closed gates if necessary to maintain their access to livestock on the grazing allotments. This measure applies to all alternatives.

Livestock Management Facilities

As described in Section 3.11, there are range improvements on allotments which are used to control livestock movement and to provide stock water. Protection measures that would be applied to all alternatives call for the protection of range improvements either by siting facilities away from them, or if avoidance is not possible, to return the facility to its original condition. Where construction or operation activity requires access across a fenceline, a gate or cattleguard will be installed and the fence braced on either side of the roadway. Approximately 350 miles of roadway would be constructed in this alternative. As more fencelines are crossed by new roads and gates installed in the fenceline, there would be more opportunity for gates to be left open and livestock to get out of the allotment. Fowler and Witte (1985) studied the effects of oil and gas development on ranch operations in New Mexico, and found that ranches had increased labor requirements from activities such as gathering cattle, fixing fences, closing gates, removing litter, and repairing vandalism damages.

In all alternatives except the No Action alternative, a water supply pipeline in the Poison Spring Bench and the Mohrland allotments would be crossed by proposed new roads. To ensure that these pipelines are not damaged, as required by the environmental

protection measures, they may have to be excavated and buried in a protective sleeve to protect against breakage from

heavy truck traffic.

4.11.2.2 Alternative A

Carrying Capacity

Approximately 2,934 acres of BLM land and 1,157 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 202 and 75 AUMs on BLM and state/private lands, respectively. This represents about a three percent reduction in AUMs on public lands.

Approximately 1,837 acres of BLM land and 722 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 127 and 47 AUMs on BLM and state/private lands, respectively. This represents less than a two percent reduction in AUMs on public lands.

A loss of 277 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 111 cattle or its equivalent being removed from the Project Area. A total of 174 AUMs would be lost during the operational phase. This would equal 70 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than five cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would increase and the potential for collisions or harassment of livestock is greater. Construction traffic is estimated to be about 372 daily trips during construction, and about 184 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

Alternative A calls for 80-acre well spacing and a significant increase in miles of roads to be built. Approximately 514 miles of roadway would be constructed in this alternative. This would result in more cattleguards and gates being installed in fencelines, with more opportunity for gates to be left open and livestock to get out of the allotment.

4.11.2.3 Alternative B1

Carrying Capacity

Alternative B1 includes a large area, located in the western half of the Project Area, where well development activity would be excluded on public lands due to critical wildlife habitat. This would significantly decrease the amount of disturbance in the Consumers Wash, Fausett, Haley Canyon, Long Bench, Porphyry Bench, Pinnacle Bench, Wattis, North Spring, Hiawatha, and the North Huntington allotments.

Approximately 1,393 acres of BLM land and 827 acres of state/private land

within the allotments would be impacted during construction, resulting in a loss of 100 and 52 AUMs on BLM and state/private lands, respectively. This represents about a 1.5 percent reduction in AUMs on public lands.

Approximately 800 acres of BLM land and 485 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 58 and 30 AUMs on BLM and state/private lands, respectively. This represents less than a one percent reduction in AUMs on public lands.

A loss of 152 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 61 cattle or its equivalent being removed from the Project Area. A total of 88 AUMs would be lost during the operational phase. This would equal 35 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than three cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action, except that the level of traffic would decrease and the potential for collisions or harassment of livestock is less. Traffic is estimated to be about 165 daily trips during construction, and about 73 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

Alternative B1 would restrict well development on many of the allotments because of wildlife concerns. Approximately 260 miles of roadway would be constructed in this alternative. The number of fencelines crossed by new road construction would be less than the Proposed Action, reducing the opportunity for gates to be left open and for livestock to get out of the allotment.

4.11.2.4 Alternative B2

Carrying Capacity

Alternative B2 has the same area of restricted development as B1, but in areas where field development would occur, it would be on a 80-acre well spacing, increasing the amount of development and land disturbance from the B1 levels.

Approximately 1,920 acres of BLM land and 1,080 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 138 and 69 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,177 acres of BLM land and 668 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 86 and 42 AUMs on BLM and state/private lands,

respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 208 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 83 cattle or its equivalent being removed from the Project Area. A total of 128 AUMs would be lost during the operational

phase. This would equal 51 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than eight cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Alternative B1 except that the level of traffic would increase and the potential for collisions or harassment of livestock would be greater. Construction traffic is estimated to be about 290 daily trips during construction, and about 139 during operation, compared to 165 (construction) and 73 (operation) in Alternative B1.

Livestock Management Facilities

Alternative B2 would restrict well development on many of the allotments because of wildlife concerns. However, the number of fencelines crossed by new road construction would be greater than for Alternative B1, increasing the opportunity for gates to be left open and for livestock to get out of the allotment. Approximately 357 miles of roadway would be constructed in this alternative.

4.11.2.5 Alternative C1

Carrying Capacity

Alternative C1 would restrict well development in scattered areas in the western half of the Project Area due to big game security areas. The Consumers Wash, Fausett, Haley Canyon, North Spring, Mohrland, and North Huntington allotments contain some big game security areas where development would be restricted.

Approximately 1,994 acres of BLM land and 837 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 138 and 50 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

Approximately 1,159 acres of BLM land and 480 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 80 and 29 AUMs on BLM and state/private lands, respectively. This represents about a one percent reduction in AUMs on public lands.

A loss of 188 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 75 cattle or its equivalent being removed from the Project Area. A total of 109 AUMs

would be lost during the operational phase. This would equal 44 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than four cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would be slightly less. The potential for collisions or harassment of livestock would generally be the same as the Proposed Action. Construction traffic is estimated to be about 205 daily trips during construction, and about 92 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

4.11.2.6 Alternative C2

Carrying Capacity

Alternative C2 would restrict well development in scattered areas in the western half of the Project Area due to big game security areas, as in Alternative C1, but would have well development occurring on a 80-acre spacing, increasing the level of development from C1.

Approximately 2,748 acres of BLM land and 1,086 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 191 and 68 AUMs on BLM and state/private lands, respectively. This represents about a three percent reduction in AUMs on public lands.

Approximately 1,703 acres of BLM land and 689 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 118 and 44 AUMs on BLM and state/private lands, respectively. This represents about a two percent reduction in AUMs on public lands.

A loss of 259 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 104 cattle or its equivalent being removed from the Project Area. A total of 162 AUMs would be lost during the operational phase. This would equal 65 cattle or its equivalent being removed from the Project Area. However, on an

individual allotment basis the impact for either construction or operation would be less than five cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as in Alternative C1 except that the level of traffic would be greater, increasing the potential for collisions or harassment of livestock. Construction traffic is estimated to be about 345 daily trips during construction, and about 168 during operation, compared to 205 (construction) and 92 (operation) in Alternative C1.

Livestock Management Facilities

Alternative C2 would restrict well development on several of the allotments because of wildlife concerns. However, the number of fencelines crossed by new road construction would be greater than the Alternative C1, increasing the opportunity for gates to be left open and for livestock to get out of the allotment. Approximately 473 miles of roadway would be constructed in this alternative.

4.11.2.7 Alternative D

Carrying Capacity

Alternative D would restrict well development in the northwest corner of the Project Area. The only change in direct impacts to allotments between this alternative and the Proposed Action is that there would be no well activity in the Trail Canyon allotment.

Approximately 2,102 acres of BLM

land would be directly impacted during the construction phase of the project, resulting in the loss of forage equivalent to about 146 AUMs. During operations, approximately 1,244 acres of BLM land would be directly impacted, resulting in a loss of forage equivalent to about 85 AUMs. Approximately

726 acres of state and private lands would be directly impacted during construction, resulting in a loss of forage equivalent to about 48 AUMs. During operations, approximately 384 acres of state and private lands would be directly impacted, resulting in a loss of forage equivalent to about 25 AUMs.

In total, a loss of 193 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 77 cattle or its equivalent being removed from the project area. A total of 111 AUMs would be lost during the operational phase. This would equal a total of 44 cattle or its equivalent being removed from the project area. However, on an individual allotment basis the impact during either construction or operation would be less than 2 cows per allotment. Allotments would be evaluated on an individual basis to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

The types of issues and potential impacts to the allotments caused by an increase in traffic and change in access would be the same as the Proposed Action. The no-development zone in the northwest corner of the Project Area is mostly in an area where there are no allotments, and overall, the potential for collisions or harassment of

livestock, for reduced quality of forage next to roadways, effects of seasonal road closures and effects to livestock management issues would not change significantly from the Proposed Action.

Livestock Management Facilities

Potential impacts to livestock facilities would be the same as the Proposed Action, including effects to fencelines and water supply pipelines.

4.11.2.8 No Action Alternative

Carrying Capacity

The No Action alternative would deny development on federal mineral estate. However, development on state and private lands would likely occur. Some disturbance would occur on public lands as a result of access roads being built to access development areas on state and private lands.

Approximately 359 acres of BLM land and 709 acres of state/private land within the allotments would be impacted during construction, resulting in a loss of 27 and 43 AUMs on BLM and state/private lands, respectively. This represents less than one-half of one percent reduction in AUMs on public lands.

Approximately 121 acres of BLM land and 433 acres of state/private land within the allotments would be impacted during the operation phase, resulting in a loss of 9 and 27 AUMs on

BLM and state/private lands, respectively. This represents about a one-tenth of one percent reduction in AUMs on public lands.

A loss of 69 AUMs would occur during the construction phase. The average livestock season is two and one-half months per allotment. This would equal a total of 28 cattle or its equivalent being removed from the Project Area. A total of 36 AUMs would be lost during the operational phase. This would equal 14 cattle or its equivalent being removed from the Project Area. However, on an individual allotment basis the impact for either construction or operation would be less than two cows per allotment. Allotments would be evaluated to determine if an adjustment to the grazing permit may be necessary.

Traffic and Access

Types of impacts to livestock and their management caused by an increase in traffic would be the same as the Proposed Action except that the level of traffic would be significantly less. The potential for collisions or harassment of livestock would be greatly reduced from the Proposed Action. Construction traffic is estimated to be about 100 daily trips during construction, and about 38 during operation, compared to 230 (construction) and 100 (operation) in the Proposed Action.

Livestock Management Facilities

The No Action alternative would restrict most well development activity to state and private lands. Approximately 154 miles of roadway would be constructed in this alternative, most of which would be built outside of the established allotments. The number of fencelines crossed by new road construction would be much less than the Proposed Action, reducing the opportunity for gates to be left open and for livestock to get out of the allotment.

4.11.3 Impacts Summary

A summary comparison of the Proposed Action and alternatives is provided in Table 2.8-2.

All of the alternatives would result in some reduction in carrying capacity due to disturbance of vegetation. Alternative A would result in the greatest loss in AUMs, approximately 202 on public lands and a total of 277 on all lands. The No Action alternative would result in the lowest impacts to allotment production with approximately 27 AUMs lost on public lands and about 69 total AUMs lost for all lands.

Alternatives A and C2 would require the greatest number of daily trips by construction and operation related traffic, and the No Action alternative would require the least amount of traffic. A lower traffic level would decrease the potential for livestock injury, fatality collisions, and the opportunity for vehicles to harass

livestock.

Livestock improvements such as fences, corrals, springs, detention dams, water pipelines, and water tanks would be protected by the RGC committed or the BLM required environmental protection measures. As long as livestock improvements are avoided during the siting of facilities, or are returned to their original condition if disturbance is unavoidable, there should be little to no impacts on the control or maintenance of livestock on the allotments. If gates are installed in fencelines that need to be crossed by roads or other facilities, there is the increased possibility for gates to be left open and for livestock to get out of the allotment. Alternatives A and C2

require the greatest miles of roads to be built and would require the greatest number of fence crossings, increasing the possibility of a gate being left open. The No Action alternative would require the least amount of fence crossings.

4.11.4 Mitigation

The RGC committed to, and the BLM requires environmental protection measures that address many of the concerns related to livestock management, including control of noxious weeds, revegetation of disturbed lands to return them to productive use, and the protection of livestock management facilities

such as fences and water improvements. The following additional mitigation measures would further reduce potential effects to livestock management:

- I. Cattleguards should be installed (to BLM weight load carrying capacity) on all high use roads to replace gates for ease of access for well equipment and workers, the general public, recreationists, and livestock operators. Using cattleguards instead of gates would reduce the possibility for gates to be left open and would improve the control of livestock movements.

4.11.5 Unavoidable Adverse Impacts

Disturbance to vegetation, resulting in a loss of forage production and a reduction in AUMs supported by the various allotments will occur to some extent under all alternatives. Road construction and an increase in traffic, resulting in an increased possibility of livestock accidents or harassment of livestock, would also occur under all alternatives, although the area affected would be reduced under some alternatives.

4.12 RECREATION

4.12.1 Introduction

Recreation-related impacts from the Proposed Action and alternatives may include the following:

- I. Engine and machine noise generated during construction and drilling and pumping operations would degrade the quality of recreational experiences for nonmotorized users. Increased truck traffic would similarly diminish the opportunity for solitude for

all recreational users and reduce the quiet atmosphere enjoyed by nonmotorized users.

- II. The quality of recreational experiences and the availability of recreational opportunities on public BLM and state lands would be diminished over the life of the project. The visibility of project facilities and activities would change from roaded natural landscapes suited for a variety of informal recreational activities to a predominantly semi-industrial environment.
- III. Increased traffic and heavy vehicles may tend to "powder" roads currently used, or planned, for mountain biking. This would make such roads less suitable for this sport, as well as increase the amount of fugitive dust that would have to be endured.
- IV. The quality of recreational experiences would similarly be diminished at developed recreation sites located adjacent to project roads and wells.

- V. Impacts relating to several recreation issues would not vary by alternative, and are discussed in Section 1.6. These include restrictions of public access in winter closure areas, and impacts to the Carbon County Fairgrounds, Four-mile Rifle Range, and Pinnacle Peak Black Powder Range.

Several environmental protection measures have been committed to by RGC or required by the BLM that would reduce impacts to recreation resources. These measures are listed in Section 2.2.5 and address such issues as siting of facilities (BLM 1) and protection of visual resources (BLM 53 - 56). Other measures that would reduce impacts to wildlife and promote successful revegetation of disturbed lands would indirectly benefit recreationists as hunting, viewing wildlife and recreating in natural appearing landscapes are important elements in the recreational opportunities available in the area.

4.12.2 Direct and Direct Impacts

4.12.2.1 Proposed Action

No Special Recreation Management Areas (SRMA), designated Wilderness Areas, or Wilderness Project Areas would be affected by the Proposed Action. Similarly, the Proposed Action would not directly impact any developed recreation areas, such as the Carbon County Country Club and Golf Course and local community park and recreation areas. The proposed project would also avoid impacting areas of highest informal recreational use, including Wood Hill and the area between Price and Kenilworth.

Impacts to recreational lands and values would occur on public lands throughout the CBM project development area. As well field

development increases, the character of the landscape would change from a semi-primitive motorized and roaded natural setting to more of a semi-industrial type of landscape. In total, the Proposed Action would impact approximately 3,146 acres of federal and state open space lands in the short-term, and 1,838 acres in the long-term.

A reduction in wildlife populations would result in a corresponding loss in hunting opportunities, and a decrease in the number of hunters. This would have an economic impact to local communities, as discussed in the Section 4.15. Due to mitigations that protect bald eagle habitat, including restricted CBM activity during winter months, the Bald Eagle Day event, sponsored by UDWR, should not be affected.

Recreationists would be displaced to other areas not affected by mineral development. This displacement would result in greater usage in displaced areas and greater competition among hunters. Impacts of project development would also include limiting the County's options for developing and promoting mountain bike trail systems.

As mentioned in Section 3.12, Carbon County has recently approved a County Trails Plan, which includes several roads/trails that would be impacted by the Price CBM Project. The major trails that would be effected include the Pinnacle Peak/Gordon Creek/Consumers Road Loop and a loop trail in the North Spring Canyon/Horse Bench area, off the main road to Wattis. The scenic quality, and consequently, the quality of the recreational experience would be impacted as trail users viewed the CBM facilities, and as they potentially encounter well field development related traffic. As part of the project description of all alternatives, several roads within the Project Area would be

seasonally closed to reduce impacts to wildlife. Closure dates are between December 1 and April 1. This would not effect the Pinnacle Peak/Gordon Creek/Consumers Road Loop since the Trails Plan also calls for restricting traffic on this loop during the same time period, also due to wildlife concerns. However, the North Spring Canyon/Horse Bench loop would be impacted by this road closure, limiting the use of the trail. The Wood Hill to Kenilworth

loop is one of the heaviest used trails in the Price area and would be part of the planned county trail system. This area would not be impacted by the Price CBM Project. It is, however, impacted by the existing Helper CBM development and is in an area planned for more extensive well development. This is discussed in Chapter 5.

An increase in traffic due to field development activities would also cause a change in the recreational setting and experience. Dispersed recreational activities such as bicycling, driving for pleasure and wildlife viewing would be impacted by the increase in traffic, dust, and noise, especially during the construction phase of the project. For those persons who do not mind the more developed environment, there would be a higher density of roads for them to bicycle or drive on. Road improvements to the Pinnacle Peak/ Gordon Creek/Consumers Wash Road would improve motorized access to a trailhead on the Manti-LaSal National Forest. Proposed roads to be built for the Price CBM Project include collector (higher use), local (moderate use) and resource (lower use) roads. These roads are being designed for certain design speeds: Collector - 25 mph; local - 20 mph; and resource - 15 mph.

Noise impacts would come from several sources, and would be at their highest levels during the construction phase. During operations, a compressor stations would emit noise levels up to 58-62 dBA at 500 feet. A bicyclist traveling by a compressor station would hear the noise generated from the compressor site for several minutes. See Sections 4.10 and 4.14 for more information on traffic and noise.

4.12.2.2 Alternative A

Alternative A would result in the same types of impacts reported for the Proposed Action. The intensity of impacts to informal recreational uses and quality of experiences would be greater, however, due to the denser development associated with the 80-acre spacing of production wells. Increased levels of noise, dust, and visual changes to the landscape would result as compared to the Proposed Action. Alternative A would impact approximately 4,453 (short-term) and 2,786 (long-term) acres of public BLM and state lands currently in open space.

4.12.2.3 Alternative B1

Alternative B1 would have fewer impacts on informal recreational opportunities, than the Proposed Action and Alternative A. This alternative would reduce impacts to recreation in the Porphyry Bench/Pinnacle Peak area by restricting CBM facilities to state and private lands. Indirect noise, dust, and visual changes would impact the quality of recreational experiences, since the CBM facilities and activities would be located on nearby state and private lands. In total, Alternative B1 would affect approximately 2,242 (short-term) and 1,292 (long-term) acres of federal and state lands currently in open space.

4.12.2.4 Alternative B2

Impacts on informal recreational uses would be similar to those described above for Alternative B1. This alternative would minimize impacts to the Porphyry Bench and Pinnacle Peak area by limiting CBM activities to state and private lands. Alternative B2 would provide for 80-acre well spacing, however, which would intensify the semi-industrial nature of the CBM development on adjacent state and private lands. Consequently, the CBM project would

result in greater indirect noise, dust, and visual impacts than those anticipated with Alternative B1. In total, Alternative B2 would affect approximately 3,257 (short-term) and 2,002 (long-term) acres of open space federal and state lands.

4.12.2.5 Alternative C1

Alternative C1 includes areas excluded from well development due to big game security

areas. This would reduce impacts in scattered areas in the Consumers Wash, Gordon Creek, Pinnacle Bench, Serviceberry Creek, Potter Wash, and Oil Well Bench areas. Other than those excluded areas, impacts would be the same as those described in the Proposed Action, including negative effects to the recreational setting (from a natural appearing landscape to a more developed, semi-industrial setting), to opportunities for hunting and viewing wildlife, to the quality of dispersed recreational activities such as driving for pleasure, OHV use, bicycling, and effects to the planned county trail system. In total, Alternative C1 would affect approximately 2,853 (short-term) and 1,666 (long-term) acres of federal and state lands.

4.12.2.6 Alternative C2

Types of impacts would be similar to alternative C1 except that this alternative provides for 80-acre well spacing which would greatly intensify the semi-industrial appearance of lands in the CBM development area. Consequently, Alternative C2 would result in greater traffic, noise, dust, and visual impacts than Alternative C1. In total, Alternative C2 would affect approximately 4,054 (short-term) and 2,530 (long-term) acres of federal and state lands currently in open space.

4.12.2.7 Alternative D

Alternative D would reduce development activity in of the Gordon Creek Wildlife Management Area, and would protect big game corridors. These actions would help reduce impacts to big game, which would also reduce potential impacts to hunting opportunities within the Project Area. The reduced activity in the Gordon Creek Wildlife Management Area would also result in less noticeable visual disturbance to travelers using the Pinnacle Peak/Consumers Wash loop drive, which is one of the trails mentioned in the Carbon County Trails Plan, and is one of the more popular scenic drives in the Price Area. Other types of impacts would be the similar to the Proposed Action (Section 4.12.2.1). Alternative D would directly impact 2,805 acres (construction) and 1,608 acres (operations) of federal and state lands currently in open space.

4.12.2.8 No Action Alternative

The No Action alternative would avoid impacting BLM lands with CBM facilities, however, access would be provided across BLM lands to state and private lands. As such, this alternative would limit impacts to public land recreational opportunities. Project-related indirect noise, visual, and dust would impact the quality of recreational experiences. In total, the No Action alternative would impact approximately 1,108 (short-term) and 580 (long-term) acres of federal and state lands currently in open space.

4.12.3 Impact Summary

A summary comparison of the impacts of the alternatives is provided in Table 2.8-2.

All of the alternatives would impact lands used for informal recreational pursuits including the planned county trail system. Reductions in the quality of recreational experiences would result in areas subject to increases in noise, dust, and

traffic, as well as visual changes to the character of the landscape. Impacts to recreational opportunities in the CBM development area would cause displacement of persons to other areas, which in turn would increase use and hunting competition in those areas. Among the alternatives, the No Action alternative and Alternative B1 would result in the least impacts to informal recreational areas,

since all would avoid high use public BLM lands near Porphyry Bench and Pinnacle Peak. Alternative A would have the greatest impact on informal recreation due to the 80-acre well spacing throughout the CBM development area.

4.12.4 Mitigation

- I. RGC should employ the services of a landscape architect or other appropriate professional to assist in the siting and design of facilities associated with the CBM development in special circumstances where there may be the potential for significant impacts to sensitive land uses such as residential and recreation areas.
- II. Carbon County, BLM, SITLA, RGC, private landowners, and other potential CBM developers within the cumulative effects area should work together to identify new potential trail corridors, and potential funding sources for alternative trail construction to mitigate impacts to existing trails that may be significantly impacted by CBM development.
- III. The fairgrounds and the roads next to the fairgrounds are under the jurisdiction of Carbon County and the BLM has no authority to enforce mitigations. However, the following actions would reduce impacts to the fairgrounds. The road on the west side of the fairgrounds should be moved slightly west of its existing location, if possible. There should be a physical separation (fence) between the

roadway and the fairgrounds, and trees planted along the fence to reduce the visual and noise effects of traffic. Speed limits for that section of the road along the fairground should be set very low (<20 mph). The County should advise RGC when significant events will take place at the fairgrounds such as rodeos and the county fair, and RGC should use alternative access roads during those periods.

4.12.5 Unavoidable Adverse Impacts

Public lands with recreational values for hunting, wildlife viewing, horseback riding, hiking, and biking would be affected, regardless of the alternative selected. Impacts to recreation include reductions in the quality of recreational experiences afforded by public lands. These impacts would result in a displacement of recreationists to other areas in the region, thus increasing the amount of use such areas receive and competition among hunters.

4.13 VISUAL RESOURCES

4.13.1 Introduction

The visual impacts resulting from the Proposed Action and alternatives fall into the following general impact categories:

1. **Impacts to Landscape Character and Quality.** The construction and operation of the project facilities would transform significant portions of the existing Project Area landscapes from a natural

to a semi-industrial character. Character changes would result from grading natural landforms and removing pinyon/juniper, sagescrub and grassland vegetation patterns for wells, roads, pipelines, evaporation ponds, compressor stations and electrical substations. Character changes would be most dramatic at compressor stations, injection wells and evaporation ponds due to the amount of acreage required at these sites, and the industrial appearance of these facilities. During operation, the semi-industrial character of the landscape would be lessened, but still on-going due to both the presence of the facilities and associated truck traffic, dust and maintenance activities.

2. **Visual Impacts to Viewers.**

Visual sensitivity depends upon viewer attitudes towards landscape changes and the number of viewers potentially affected. Within the Project Area, viewers sensitive to landscape and visual quality changes brought about by the project consist of local residents, persons engaging in dispersed recreational activities on public or private lands, and travelers along state highways and local thoroughfares. Visual impacts to each of these types of viewer groups would depend upon a number of factors including: distance from which the facilities are viewed; the number and type of facilities and roadways seen; and whether the facilities are screened by vegetation and/or topography or openly visible and/or skylined on ridgelines.

3. **Visual Impacts Resulting from**

Regional Haze and Reductions in Air Quality. Over the past 20 years, regional visibility has diminished due to the combined influences of air pollutants and climatic conditions. Regional haze reduces both the outer limits of visible landscapes as well as the clarity and color of landscape features seen at closer ranges. The CBM project facilities will contribute to regional air quality haze due to nitrogen oxide emissions from the compressor stations. These types of impacts are discussed in the Air Quality Section (4.3).

4. **Reductions in Dark Skies and Visibility to Stars and Other Celestial Objects.** The proposed project and facilities would require night lighting at compressor stations, injection wells, evaporation ponds and drilling rigs. Flaring of gas would also impact nighttime views. Night lighting of these facilities may be visible from sensitive viewing locations and/or affect the darkness of skies and the related visibility and clarity of celestial objects.

RGC has incorporated several mitigation measures into their project description, including: dust suppression on roads and construction zones during construction and operation using magnesium chloride (RGC 1) and the undergrounding of electrical utility lines. On BLM lands, measures BLM 53 through 56 would be followed which address grading and reclamation of access roads, litter control, and conformity with VRM classes.

The visual impacts of the Proposed Action and alternatives were estimated based upon the

degree of change, or contrast, that each alternative would cause to the natural landscape and to sensitive viewers. Contrast ratings were conducted in the field from representative KOPs that served as proxies for the Project Area and viewer groups as a whole. KOPs are shown on Plate 12 and anticipated visibility conditions are shown on Plate 25. Table 4.13-1 summarizes the assessment results. The following criteria were used to determine the significance of visual impacts:

Impacts to Natural Landscapes

The amount of land dedicated to the project would vary (see Tables 2.2-1, 2.3-1, 2.4-1, 2.4-3, 2.5-1, 2.5-3, 2.6-1, and 2.7-1) by each type of facility and alternative. Cumulatively, however, any of the project alternatives would create a large-scale web of industrial facilities, activities, and roads.

Visual contrasts in line and form would be strong in almost all cases. Color and texture contrasts would range from strong to moderate. Movement of trucks and wells would also contribute to strong visual contrasts throughout the Project Area.

Impacts to landscape character were assessed according to the degree to which the composite buildout of the proposed project or alternatives would comply with the BLM's VRM classes for Project Area lands. This approach recognizes that, while individual well sites might not be visually dominant in the characteristic landscape, the cumulative effects of truck traffic, fugitive dust, and other construction/maintenance activities would be. Significant impacts were consequently identified

where the project would directly impact VRM Class III or II landscapes. Landscape impacts were considered less than significant in areas designated as VRM Class IV. (See Section 3.13 for VRM Class definitions.)

Impacts to natural landscape quality would also occur and would be most evident in adjoining areas with open, low shrub/grassland vegetation cover. Within the Project Area, this type of open visibility occurs on the benches, in the agricultural valleys, and in areas with desert salt, sagebrush and grassland vegetation cover. Adjacent areas with pinyon/juniper vegetation would be less affected indirectly due to the intermittent visibility conditions afforded by this vegetation type. (See Plate 16, Vegetation.) Impacts to natural landscape amenities are considered significant where VRM Class II/III public lands would be openly visible and within 0.5 mile of project roads, compressor stations, injection wells and evaporation ponds. In these areas, project facilities and activities would still dominate the characteristic landscape. Impacts to adjacent landscapes' quality would not be significant in instances where facilities are limited to a few wells or vegetation patterns largely screen the visual influences of the project.

Impacts to Viewers

The visual contrasts of the project facilities, roads and construction/operation activities were evaluated for different viewer groups taking into consideration the distance between viewers and project facilities/activities; the amount and type of facilities/activities viewed; whether facilities would be screened or not by vegetation and/or topography; and duration of view, as reflected by viewer activity. The degree of visual contrast potentially created by the project facilities and activities in the line, form, color and texture of the viewed landscape were assessed. The degree of change in each visual element was rated according to three levels: strong, moderate and weak. The following factors were considered in determining the significance of impacts to sensitive viewers:

Distance Zones - The intervening distance between project facilities and activities and sensitive viewers would largely determine the degree to which the project is visually evident and dominant in the seen landscape.

Within a foreground (0 to .5 mile) distance zone, the project facilities, roads, truck traffic, dust and other activities would visually dominate the landscape in most cases. Visual impacts to sensitive viewers are considered significant within this distance zone. Within middleground (.5 to 4.0 miles) distances, the project may visually dominate the seen landscape, particularly in instances where panoramic views to multiple facilities and roads are possible or where wells are visibly skylined on ridgelines.

Vegetation Cover - In general, open grassland, sagescrub, agricultural, and/or desert salt vegetation cover would provide little to no screening of project facilities and activities. These types of open, low covers predominate in the central and eastern parts of the Project Area. Significant impacts to sensitive viewers would occur where facilities and activities are proposed within foreground and middleground distance zones with these types of open settings.

Landforms - Much of the Project Area consists of a series of flat to rolling benches and open plains and valleys. Escarpments connecting these *landforms* provide landform relief and diversity in rockforms and color. Landforms largely determine the degree to which wells would be skylined on visible ridgelines or viewed as a large semi-industrial field from elevated viewpoints. In general, significant visual impacts would occur where existing open panoramic views of the natural landscape would be transformed to views of a massive semi-industrial scale.

Project Facilities - The CBM project facilities/activities would impose different degrees of visual change by virtue of their size, height, color, location and movement. Facilities are described and shown graphically in Section 2.2 of this EIS. During project construction, the amount of road and pipeline construction, grading, truck traffic, dust and equipment would impose strong contrasts in line, form, color, and texture at all facilities, construction well sites.

Construction-related visual impacts to sensitive viewers are considered significant for all the alternatives within foreground

and middleground distance zones. Figure 4.13-1 shows photographs of typical CBM construction equipment and activities.

Following construction, the degree of visual contrast created by the project facilities would vary. Visual contrasts of compressor stations, roads, pipeline corridors, evaporation ponds and injection wells would remain strong, and significant, within foreground distance zones. Figure 4.13-2 contains photographs of compressor station facilities. Evaporation ponds and injection wells may vary in visual contrast from strong to moderate within foreground to middleground distance zones. Visual contrasts of individual well sites would range from strong to weak depending upon distance and the degree of vegetation/landform screening. Figure 4.13-3 shows representative equipment at production well sites and along pipeline corridors. Within background distance zones, all facilities are expected to have a moderate to weak contrast, except for road systems, where fugitive dust may cause strong and highly visible contrasts within the seen landscape. Figure 4.13-4 shows existing RGC facilities from middleground and background distances.

Table 4.13-2 summarizes the degree of visual impacts expected to result to various types of sensitive viewer groups in the Project Area. Impacts are discussed below by alternative.

Table 4.13-3 compares the alternatives according to the number of acres of designated VRM Classes that would be affected on Federal BLM lands. These data correspond to the classes designated by BLM in the 1970s. Table 4.13-4 summarizes how BLM Class designations would pertain to landscape values and visual sensitivities. This table summarizes the amount of area potentially impacted that lies within the foreground distance zone (0.5 mile) of residential areas, recreational sites and trails and State Highway 6/191.

4.13.2 Direct and Indirect Impacts

4.13.2.1 Proposed Action

Landscape Quality and Character

The Proposed Action would dramatically alter the existing natural landscape character of areas developed for CBM facilities. Plate 2 shows the distribution of facilities within the Project Area. Table 2.2-1 summarizes the overall amount of physical disturbance anticipated with the proposed project. Section 4.10 further describes the amount of truck traffic anticipated during project construction and operation phases. Impacts to landscape character would be greatest during construction and at five compressor sites (25 acres), seven evaporation ponds (28 acres) and seven injection wells (56 acres), along with 51 miles of pipeline routes and 350 miles of roads. In total, 601 production wells would be constructed.

Overall, approximately 2,353 acres would be permanently converted from a natural to semi-industrial character for the proposed facilities. Approximately 4,095 acres would be disturbed during construction. The federal lands affected by the Proposed Action are currently

designated as VRM Class IV (2,114 acres) or III (275 acres). The proposed project would be in conformity with Class IV VRM objectives and on state lands where no visual management objectives have been adopted. Project activities may exceed the BLM's VRM Class III management objectives for visual changes. Based on present-day conditions, the Proposed Action would affect approximately 1,793 acres that meet VRM Class II or III criteria.

Landscape and visual impacts would be greatest during construction due to the amount of disturbance anticipated and the presence of construction crews, trucks, dust, drilling rigs, etc. Cumulatively, these activities may be highly visible, depending upon specific viewing conditions, due to fugitive dust and construction equipment not subject to visual blending and painting. During operation, the intensity of visual changes would be reduced at well sites and along roadways by both the limited number of maintenance crews and trips required, as well as the painting of permanent facilities. However, visual changes would remain strong at the compressor stations, evaporation ponds and injection wells, due to the scale of these facilities and on-going presence of trucks, and operation activities.

Visual Impacts to Viewers

Viewer impacts are summarized for the proposed project on Table 4.13-1 and 4.13-2. Plate 25 shows the composite visibility of Project Area lands that could be visible from several representative Key Observation Points in the Project Area. Significant visual impacts may result, depending on specific location, on local rural residential areas and to recreationists using BLM public lands. Visual impacts to rural residential areas would primarily result from the presence and movement of construction equipment, grading and use of project roads, and operation of wells within foreground (0.5 mile) and middleground (0.5 to 4.0 mile) distances. Rural residential areas south and west of Price, along Gordon Creek Road, and west of Elmo may be significantly affected by movement of trucks and associated fugitive dust, construction equipment, and long-term operation and movement of production wells. Within these areas, existing rural agricultural and natural views would be transformed to landscapes of a semi-industrial character due to presence and movement of wells, roads, vehicles, and ancillary facilities such as pipelines, manhole barricades, and electrical boxes at well sites. Viewed within a foreground distance zone, and to 200 feet from residences, these facilities would be visually dominant and significantly alter the residential settings. From middleground distances, views to multiple wells and relocated facilities and roads would also cumulatively alter the existing natural, rural character of these residential areas to a mixed semi-industrial setting.

Visual impacts to the quality of views and recreational experiences along county designated trails west of Price would also be significant. Existing county trails along Pinnacle Creek and Bench roads would be converted and/or used as major collector roads and

pipeline corridors. A compressor station and related facilities would also be located adjacent to this trail system. Other recreational areas significantly affected by foreground views to wells, trucks and fugitive dust include Consumer Wash Road, Gordon Creek Road, Horse Bench and Porphyry Bench.

Visual changes associated with the Proposed Action would be substantially less evident, and not significant, from Highway 6, from the communities of Price, Elmo, and Wellington, and from the Carbon County Country Club. Moderate levels of visual impact, associated with trucks, fugitive dust and well construction and operation, would occur at the fairgrounds, and along Highways 10, 122 and 155.

Regional Haze Impacts

Impacts associated with regional haze and reduced visibility are discussed in Section 4.3, Air Quality.

Night Lighting and Impacts to Dark Skies

Lights would be required at compressor stations, injection wells, evaporation ponds and on drilling rigs. Lights would be 250 watts, clear bulbs, emitting 30,000 lumens. Eight lights would be required on each of the six compressor stations, with two lights on each of the seven injection wells and evaporation ponds. During construction, lights would be on drilling rigs, with a maximum of 2 to 6 drilling rigs operating at any one time. Flaring of gas would also impact nighttime views. Lighting on permanent facilities would be mounted and directed downwards. Night lighting of drilling rigs may be intermittently visible during construction from residential areas, along travel routes and from elevated

public vistas (e.g., Woodhill). Permanent lighting would have no perceivable effect on the quality of dark skies in the region.

4.13.2.2 Alternative A

Alternative A would result in the same types of impacts to landscape character and viewers. Compared to the Proposed Action, this alternative would cause greater landscape modifications for 514 miles of roads and 1103 well pads, however, due to the 80 acre spacing of production wells. Landscape disturbances and night lighting impacts at compressor sites, injection wells and evaporation ponds would be the same as for the Proposed Project. See Plate 4 and Table 2.3-1.

Visual impacts to viewers are summarized on Table 4.13-2. Impacts to rural residents and recreationists would be also be significant and greater than reported for the proposed project. Overall, Alternative A would initially disturb 5,758 acres, with 3,585 acres permanently converted to industrial production and use. Alternative A would impact approximately 402 acres of federal BLM lands designated as VRM Class III and 2,889 acres of lands designated as Class IV (Table 4.13-3). Based upon present-day conditions, approximately 2,396 acres of lands affected by Alternative A would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.3 Alternative B1

Alternative B1 would result in the same types of landscape character changes and impacts to viewers as the proposed project. Plate 5 and Table 2.4-1 summarize the general location and amount of land disturbance anticipated during the construction and operation of this alternative. Table 4.13-2 summarizes the visual impacts to viewers. Alternative B1 would limit the amount of CBM development on lands west of Price. In areas restricted from development, the predominantly natural roaded character of the landscape would remain largely unchanged. These areas would still be available to the public for aesthetic enjoyment and related recreational experiences. Visual impacts to the county designated trail system would be significant, however, since portions of the trail would still be used for transportation and pipeline corridors needed for project developments occurring on nearby state lands.

In total, Alternative B1 would temporarily disturb 3,151 acres, with long-term permanent changes to 1,818 acres. Compared to the Proposed Action, this alternative would cause less disturbances for injection wells (5 sites/25 acres), evaporation ponds (5 sites/20 acres), production wells (436 wells/611 acres) and roads (260 miles). With respect to VRM Class conformity, Alternative B1 would impact approximately 215 acres of federal Class III landscapes and 1,307 acres of federal Class IV landscapes (Table 4.13-3). Based on present-day conditions, approximately 1,375 acres potentially affected by Alternative B1 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.4 Alternative B2

The visual and landscape character impacts of Alternative B2 would be similar to, but of greater intensity than, Alternative B1.

The visual impacts of this alternative are considered to be similar to the Proposed Action

for most viewer groups. Landscape impacts would also be similar to the Proposed Action in terms of overall disturbance; however, Alternative B2 would retain larger blocks of natural landscapes intact. See Plate 6 and Table 2.4-3 for information on the location and quantity of changes anticipated.

Table 4.13-2 summarizes the impacts to viewers.

Overall, Alternative B2 would temporarily disturb 4,510 acres, with long-term permanent changes to 2,775 acres. Compared to the Proposed Action, this alternative would cause greater impacts for production wells (831 wells) and roads (357 miles). With respect to VRM Class conformity, Alternative B2 would impact approximately 308 acres of federal lands designated as Class III and 1,797 acres designated as Class IV (Table 4.13-4). Based on present-day conditions, an estimated 1,829 acres potentially affected by Alternative B2 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.5 Alternative C1

Impacts of Alternative C1 to landscape character would be similar to, but less than, the Proposed Action. This alternative would restrict various areas from development and limit access during portions of the year for wildlife management purposes. Relevant information on the location and amount of disturbance associated with this alternative are shown on Table 2.5-1 and Plate 7.

Visual impacts from Alternative C1 are summarized on Table 4.13-2 and would be similar to the Proposed Action for most viewer groups. This alternative would retain the natural landscape character in selected areas used for dispersed recreational activities. Alternative C1 would impact approximately 259 acres of federal lands designated as VRM Class III and 1,890 acres designated Class IV (Table 4.13-3). Based on present-day conditions, an estimated 1,718 acres affected by this alternative would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.6 Alternative C2

The impacts of Alternative C2 on landscape character are summarized on Table 2.5-3, with approximate locations of proposed facilities shown on Plate 8. Overall, this alternative would have similar impacts on viewers as Alternative A. Viewer impacts summarized on Table 4.13-2.

Alternative C2 would temporarily disturb 5,318 acres, with 3,306 acres permanently converted to industrial uses and facilities. Compared to the Proposed Action, this alternative would have similar impacts at five compressor sites and along 52 miles of pipelines. Greater impacts would occur from an additional injection well and evaporation pond, 1,013 production wells, and along 473 miles of roads. Alternative C2 would impact approximately 372 acres of federal lands designated VRM Class III and 2,606 acres designated Class IV (Table 4.13-3). Based on present-day conditions, approximately 2,751 acres impacted by Alternative C2 would meet VRM Class II or III standards (Table 4.13-4).

4.13.2.7 Alternative D

Alternative D is similar to the Proposed Action in the extent of potential effects to the visual resources within the Project Area, except for the northwest corner where the no development area, shown on Plate 8A, would result in little to no visual impacts in that portion of the Project Area. Table 2.6-1 displays the direct disturbance impacts anticipated during the

construction and operational phases of the project. Table 4.13-2 summarizes visual impacts to viewers. Except for the viewpoint along the Consumers Wash road, potential effects are the same or similar to the Proposed Action. Viewers along the western section of the Consumers Wash road would have greatly reduced visual

impacts, which is important, as this is one of the more scenic landscapes within the Project Area, and contains a portion of the Consumers Wash/Pinnacle Peak loop drive, identified as one of the more popular recreational drives in the Price Area.

In total, Alternative D would impact 3,712 acres in the short-term and 2,160 acres in the long-term. Compared to the Proposed Action, this alternative would have 56 fewer wells and one less compressor facility, injection well, and evaporation pond. As Table 4.13-3 shows, during construction Alternative D would directly impact 253 and 2,011 acres of BLM designated VRM Class III and Class IV lands, respectively. During operation, approximately 146 and 1,193 acres of designated VRM Class III and IV lands would be impacted. Based on the analysis that mapped potential present-day VRM conditions, this alternative would impact 1,214 acres land which would likely meet VRM Class II/III standards during construction, and 679 acres during operation.

4.13.2.8 No Action Alternative

Under the No Action alternative, development would still occur on state lands and lands with state mineral rights. Plate 9 shows the distribution of facilities for this alternative, and Table 2.7-1 summarizes the overall amount of temporary and permanent disturbances anticipated. The No Action alternative would still result in the long-term loss of 1,050 acres for 228 production wells, five compressor sites, four evaporation ponds and four injection wells. Approximately 47 miles of pipeline and 154 miles of roads would be built on state mineral lands.

Federal lands would remain predominantly natural in character, although additional access roads to state and private lands would create

soil/vegetation contrasts, as well as truck traffic and fugitive dust. These visual changes would be moderate to strong in areas directly affected. The No Action alternative would still significantly affect views from rural residential areas and affect the visual quality along the County's designated trail system at Pinnacle Creek/Bench Road. Table 4.13-2 summarizes the visual impacts to viewers that could result from the No Action alternative. With respect to conformity with designated VRM Classes, the No Action alternative would impact only 69 acres of federal lands designated VRM Class III and 345 acres of lands designated as Class IV. Based on present-day conditions, the No Action alternative would still impact approximately 1,085 acres that are estimated to meet VRM Class II or III standards (Tables 4.13-3 and 4.13-4).

4.13.3 Impact Summary

A summary comparison of impacts of the Proposed Action and alternatives is presented in Table 2.8-2.

All the alternatives, including the No Action alternative, would substantially change the visual quality of portions of the Project Area and result in significant visual impacts to rural residences, to public lands used for recreation and to local travel routes. Natural pinyon-juniper and grassland/shrub landscapes would be changed to a more semi-industrial character. These types of changes are consistent with the BLM's VRM objectives for Class IV landscapes. Changes to Class III lands would most likely exceed the level of acceptable visual change, however, depending upon visibility conditions and the number and type of facilities planned. Private rural residential lands, estimated as Class II or Class III VRM due to viewer attitudes and numbers, would also be affected by reduced qualities in rural natural settings. Mitigation measures are needed

throughout the Project Area to maintain the visual quality of views from Class II and III areas.

With respect to landscape character and quality impacts, the No Action alternative avoids impacts to the greatest extent. Alternatives B1 and C1 also minimize the amount of disturbance, compared to other alternatives being considered.

All of the alternatives, including the No Action alternative, would affect views from a variety of Key Observation Points associated with residential areas, recreational lands, and travel routes. Table 4.13-2 shows the overall comparison of visual impacts for all alternatives.

4.13.4 Mitigation

Mitigation measures suggested below would further reduce the long-term visual impacts of the project facilities.

- All above ground facilities (e.g., wells, tanks, batteries, etc.) that would remain on site six months or longer, should be painted upon construction completion. Prior to construction each year, facility paint color(s) should be chosen in consultation with BLM to blend the facilities with the surrounding natural or rural landscape tones. Colors compatible with desert salt (e.g., Carlsbad Canyon), pinyon-juniper and agricultural landscapes should be used. BLM should review and approve a color palette prior to issuance of APD. Exceptions to this mitigation include facilities that need to be a certain color due to operational needs, such as portions of compressor facilities that need to be white for temperature control, and pipeline manhole guards

that need to be yellow for safety reasons.

- Wells should be sited to minimize skylining to the greatest extent possible. Setbacks along bench edges or within pinyon-juniper vegetation communities should be followed to reduce skylining of wells and drilling rigs. Prior to issuance of APD, a BLM recreation/visual specialist should review the tentative locations of wells and provide recommendations of well placements if visual skylining impacts can be avoided.
- Ground disturbance activities, cut and fills, and removal of vegetation should be strictly confined to areas designated in the BLM-approved APDs. Minimizing disturbance would reduce contrasts between exposed soils and natural vegetation.
- Juniper and pinyon trees should be protected and used as screening for facilities to the greatest extent possible. Juniper and pinyon trees can potentially screen roads, activities and facilities not afforded by grassland and sagescrub vegetation.

Reclamation plans approved by the BLM, UDOGM and private landowners should be followed and monitored for at least two growing seasons.

4.13.5 Unavoidable Adverse Impacts

Unavoidable, adverse and significant impacts to landscape character or viewers would result from the proposed project or any of the

alternatives, including the No Action alternative. Unavoidable adverse impacts are discussed under the No Action alternative.

Mitigation measures described herein may minimize the degree of impacts that would occur, but would not substantially eliminate changes to the quality of existing settings and views described in this EIS.

4.14 NOISE

4.14.1 Introduction

The noise impact assessment estimates ambient noise levels resulting from construction activities, drilling, and operation of compressor stations and pumps. The assessment is performed by adding expected noise levels from these activities to existing background levels.

The Environmental Protection Agency (USEPA 1974) has identified an L_{dn} level of 55 dB as the maximum sound level that will not adversely impact public health and welfare. For the purposes of this assessment, a level of 55 dBA is used as the criteria for a significant adverse impact.

4.14.2 Direct and Indirect Impacts

4.14.2.1 Proposed Action

Impacts of Construction

Impacts from construction would be temporary and would result primarily from heavy equipment and vehicle traffic. The sound levels at a distance of fifty feet are presented in Table 4.14-1 for various types of construction equipment. Estimates of noise attenuation can be made by reducing noise levels by a factor of 6 dB for each doubling of distance. Using this formula, noise levels would be expected to fall below the 55 dB level at a distance of approximately 800 to 3200 feet from the construction activities. However, since construction activities would occur only during daylight hours, and background levels in the Project Area are relatively low, the L_{dn} average values are expected to be below the significance levels. The actual noise levels experienced by a receptor will depend on the distance of the receptor from the construction activities, and residences located in close proximity to the construction activities could experience significant impacts.

Impacts from drilling activities would be expected to be similar to those from construction. Monitoring done for similar projects (WCC 1988) indicates that noise levels fall below 55 dB L_{dn} at approximately 500 feet from a wellpad. Thus, receptors located within 500 feet would be impacted.

An analysis was conducted to determine the number of residences within 500 feet of the proposed wells (see Table 4.10-2). For the 160-

acre well spacing assumed for the Proposed Action, 59 residences have been identified that would be within 500 feet of a well pad. Each of these residences would potentially be impacted by noise associated with the drilling and well workover activities. The drilling of each well would occur over a one- to six-day period. Where possible, drilling would not occur late at night, and would not occur during the winter (between December 16 and April 14 of the following year).

Impacts of Operation

In addition to drilling and construction activities, the major noise sources during operation would be the compressor stations. Each compressor station would include gas and/or electric driven compressors housed in an enclosure. Based on information provided by Caterpillar Inc. (Johnson 1996), noise levels from the operation of such compressordrivers would be approximately 80 dB at a distance of 50 feet. However, the enclosure would reduce the noise level by approximately 30 dB. Thus, noise from compressor station operation would not be expected to exceed the impact significance criteria.

Noise impacts during field operations would also include vehicle traffic, wellhead operation, well workovers and drilling. Noise levels from these sources would be expected to be as high as 60 to 90 dB at a distance of 50 feet, similar to construction activities. Receptors located within 500 feet of these activities would experience significant impacts.

4.14.2.2 Alternative A

Alternative A would involve full development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Similarly, Alternative A would also involve the same number of compressor stations during operation. However, the reduced well spacing increases the number of residences located within 500 feet to construction or operation activities to 76.

4.14.2.3 Alternative B1

Alternative B1 would involve partial development of project facilities using a well spacing of 160 acres. Impacts from construction would be similar to those from the Proposed Action. Similarly, Alternative B1 would also involve the same number of compressor stations during operation. Fifty-nine residences would be located within approximately 500 feet of construction and operational activities.

4.14.2.4 Alternative B2

Alternative B2 would involve partial development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative B2 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. However, the reduced well spacing would increase the number of residences located within approximately 500 feet of construction or operation activities to 76.

4.14.2.5 Alternative C1

Alternative C1 would involve partial development of project facilities using a well spacing of 160 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative C1 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. Fifty-nine residences would be located within 500 feet of construction and operational activities.

4.14.2.6 Alternative C2

Alternative C2 would involve partial development of project facilities using a well spacing of 80 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative C2 would involve the same number of compressor stations during operation. However, the number of engines would be less at some stations. However, the reduced well spacing would increase the number of residences located within 500 feet of construction or operation activities to 76.

4.14.2.7 Alternative D

Alternative D would involve full development of project facilities, outside of the no development area, using a well spacing of 160 acres. Impacts from construction would be similar to those from the Proposed Action. Alternative D would have one less compressor station during operation. Fifty-nine residences would be located within approximately 500 feet of construction and operational activities.

4.14.2.8 No Action Alternative

The No Action alternative would involve development on State and private lands. Impacts from construction would be similar to those from the proposed action. During operation, the number of compressor stations would decrease, thus making it less likely that residences would be located in close proximity to a station. Residences located within 500 feet of construction and operational activities would be approximately 46.

4.14.3 Impact Summary

The proposed action and each of the alternatives would lead to short term increases in noise levels during construction. The use of enclosed compressor stations would mitigate some operational impacts. However, vehicle traffic, well workovers and drilling would produce short-term locally elevated noise levels. The impacts experienced at a given receptor would depend on the distance between the receptor and the activity.

4.14.4 Mitigation

In cases where project facilities are located close to sensitive receptors, mitigation measures are recommended. The use of enclosures for the compressor station engines would reduce noise levels during operation to acceptable levels. Also, mufflers may reduce noise levels from pumps and other equipment.

4.14.5 Unavoidable Adverse Impacts

Construction and operational activities would result in intermittent and short-term unavoidable adverse impacts to receptors located within approximately 500 feet of the activity.

4.15 SOCIOECONOMICS

4.15.1 Introduction

The following sections address potential project impacts on socioeconomic conditions in the Project Area portions of Carbon and Emery counties. The discussions will focus primarily on the scoping issues identified in Section 1.6.1.

In terms of significance criteria, the proposed project would have significant impacts on socioeconomic conditions and quality of life in the Project Area if:

- I. Population growth were induced by the project that would exceed the capacity of the local housing market, community facilities and services, or otherwise cause significant growth-related social and economic changes;
- II. Local government fiscal conditions were impacted in such a way that revenues would not adequately provide public facilities and services at established levels;

- III. Project-related changes in existing ways of life that cause community discontent sufficient to raise conflict and organized response/opposition.

Methodology

For the Proposed Action and its alternatives, direct employment and earnings impacts are associated with employment and payment of wages by RGC and its contractors to workers directly involved with the project. For the Proposed Action, the direct employment values presented in this analysis were provided by RGC, which has projected its future staffing and contracting needs over the life of the project.

Woodward-Clyde estimated direct earnings, using current salary and wage rates for various RGC and contractor employees (provided by RGC) and applied them to the projected mix of employee types (managers, supervisors, tradesmen, etc.) on an annual basis over the life of the project. All earnings were calculated and are presented in current 1996 dollars. For transient construction workers, who reside in the Project Area on a seasonal basis, the estimated expenditure of earnings in the local economy was assumed to be the daily per diem rate these workers are paid for lodging and meals. This assumption was based on input from the Governor's Office of Planning and Budget, which, in various studies, has found expenditure of earnings by transient workers is very limited beyond actual living expenses. For the project alternatives, employment and earnings values were scaled, based on the number of wells that would be developed, and miles of roads that would be constructed. Since

RGC has been operating in the Project Area since 1993, and is currently employing many workers and paying wages, royalties and taxes, the analysis of economic and fiscal impacts of the Proposed Action and its alternatives focuses on what the net increase or decrease of employment or earnings would be in the Project Area, relative to current conditions.

Indirect impacts are associated with project-related purchases of assorted equipment and supplies, such as pipe, well casing, and valves from vendors. Some of these purchases would be from businesses within Carbon, and possibly Emery Counties, while other purchases would be from businesses outside of the Project Area, in cities such as Vernal. The discussion of the indirect impacts of this project will focus primarily on purchasing activity from businesses within the Project Area. This local area purchasing activity would generate indirect economic impacts on the Project Area through increased hiring and associated payment of earnings to people working at these businesses.

Induced economic impacts are associated with the expenditure of project-related earnings within the communities of the Project Area on housing, gasoline, food, and numerous other goods and services. In general, by increasing sales of these goods and services, the proposed project would induce additional hiring of workers and associated payment of earnings by the businesses providing the goods and services.

For calculation of both indirect and induced economic impacts of the project, an input-output (I/O) model of the joint Carbon and Emery county economy was run using both data provided by RGC on purchasing activity, and

earnings figures calculated by Woodward-Clyde, based on RGC's projected employment for the project. The I/O model was constructed by the Utah Governor's Office of Planning and Budget specifically for Carbon and Emery Counties. The model was run with the

assistance of the Utah Department of Natural Resources, Office of Energy and Resource Planning. In brief, the model calculates estimated employment and earnings that would be generated through purchasing

activity and expenditure of earnings, as described above, by applying economic multiplier effects to purchases and expenditures. It is important to note that while the model was constructed and run by state government agencies, the employment and earnings data used to compute input values for the model were provided by RGC and Woodward-Clyde. Thus, the indirect and induced economic impacts presented in the analysis are not the official projections of the State of Utah.

Since the emphasis of the analysis is the net change to the Project Area relative to current conditions, the indirect and induced economic impacts predicted by the model for the future were compared with those calculated by the model for 1996, using current earnings and purchasing values as inputs.

4.15.2 Direct and Indirect Impacts

4.15.2.1 Proposed Action

Employment and Earnings

The Proposed Action would directly create numerous jobs in the Project Area over the life of the project, which is estimated to be roughly 30 years. Table 4.15-1 provides a detailed breakdown of job types over the life of the project for all alternatives. The table provides both total direct project employment and the net increase/decrease in employment for local area residents, relative to current employment conditions. Table 4.15-2 summarizes the change in total direct employment of local area residents for all alternatives. In general, project-related direct employment would jump from current levels of about 164 workers to 171 workers in the 1997 construction season and increase gradually until about the year 2006, when employment would reach its peak at about 214 positions. Thus, at project peak, the Proposed Action would result in a net increase of about 50 jobs (a 2.6% increase in the current mining/oil and gas employment sector), relative to current conditions. The vast majority of these jobs would be occupied by local area residents. After completion of the construction phase of the project, employment would drop off sharply in the year 2007 to about 98 positions as the number of construction workers would be sharply reduced. This completion of construction would result in the unemployment of about 33 local construction workers (a 7.4% loss of current construction employment) that would have to find alternative sources of employment in the local area.

Project employment in the post construction phase would be primarily related to CBM field operation and maintenance (RGC employees), as well as gradual reclamation of the field and associated roads as gas wells go out of production (estimated to be 30 local contractors). During that period, from roughly 2006 to 2026, employment would gradually diminish from about 98 positions to 50 in the year 2026. This decline in employment would comprise a net loss of up to 31 jobs, relative to current conditions. At the very end of the project, when employment would drop to zero, around 2027, the Project Area would experience a net loss of about 81 positions, compared with current conditions. This loss of 81 jobs would comprise a 3.5% loss in employment in the mining/oil and gas and construction sectors, but a less than one percent decrease in total Project Area employment. These unemployed workers would have to find work on other CBM or mining projects, or take lower paying jobs in the service and trade industries. Figure 4.15-1 provides an illustration of projected net increases/decreases in employment of local area residents by alternative over the life of the project.

In terms of employment types and recruiting by the project applicant during the construction phase, about 63 workers would be seasonally employed by a local area construction contractor that would be hired by RGC to construct and maintain roads and well pads, construct utility trenches, and install underground gas pipelines, water pipelines, and underground electric lines. This level of contractor employment would be similar to current conditions. Thus, no net increase in local contractor employment is expected to occur during the construction phase of the project (Table 4.15-1). Examples of local contractor jobs would include gravel and water truck

drivers, heavy equipment operators, and pipeline workers. According to the current construction contractor, workers required to staff the project have been and would be hired almost entirely from the local communities in the Project Area (Jensen 1995).

Similarly, RGC would directly hire production hands to monitor and maintain CBM wells, as well as staff the company office in Price. These positions would be year round, rather than seasonal, construction jobs. This hiring by RGC would result in a net increase of up to 50 positions, relative to current conditions. Many of these workers would be hired from the local area, particularly if they possessed necessary skills, such as pump and pipeline maintenance, compressor and electric motor maintenance, and some computer skills needed for production monitoring. It is important to note that many of the positions could be filled by former power plant and coal mine workers still living in the local area who possess the required skills. Many of these workers are presently employed in service and trade sector jobs earning wages considerably lower than previously earned as miners or power plant construction workers. Local workers who have relevant skills and experience needed to staff the project would likely leave the typically lower paying trade and service positions for the higher wage job opportunities the project would create (\$7 - \$15/hour for tradesmen, \$17 - \$22/hour for supervisors). The employment vacancies in the trade and service industries would likely be filled by unemployed residents of the local area, including students at the CEU, who lack the skills necessary to take advantage of the higher wage jobs that would be created by the project (Utah Department of Employment Security, 1996) (Utah Governor's Office of Planning and Budget, 1996). It is also possible that certain RGC positions would have to be filled by non-

local workers where specialized expertise is required.

The remaining portion of the project workforce would consist of non-local transient construction workers with specialized expertise needed to drill and complete the CBM wells. These workers would reside in the Project Area for about six months each year during the May to November construction season. It is estimated that about 83 transient construction workers would reside in the Project Area during the construction season each year. This level of transient contractor employment would be similar to current conditions. Thus, no net increase in transient contractor employment is anticipated during the life of the project. According to RGC, the vast majority of these workers live in motels while they are working in the Project Area and do not bring their families with them to the Project Area. After completion of the construction phase of the project, it is likely that the vast majority of transient contractor employees would leave the Project Area in pursuit of other employment opportunities.

The proposed project would also generate substantial earnings, a large portion of which would be spent in the local economy for housing, food, and goods and services. Based on projections provided by RGC, it is estimated that project payroll would amount to \$2.67 million in the first year of the project (a 6.7% increase in Project earnings from 1996) and increase until the year 2005 to \$3.7 million (in current dollars) as the project reaches its employment peak (a 48% increase in project earnings from 1996). After that, during the production and reclamation phase, earnings

would gradually decline from \$2.56 to \$1.41 million annually in 1996 dollars. At the very end of the Project, when earnings would drop to zero, the Project Area would experience a net loss of \$2.5 million in local earnings relative to 1996, which would represent a 3.5 percent loss of total earnings in the Project Area. To the extent total local area earnings increase over the next 30 years, the loss of project-related earnings would actually represent less than 3.5 percent. Over the life of the project, total direct local earnings would amount to approximately \$73.3 million in 1996 dollars.

As described in the Methodology section previously, economic benefits would occur as a result of RGC purchases of equipment and supplies from local area vendors (indirect economic impacts) and expenditure of project-related earnings on housing, food, and goods and services provided by Project Area businesses (induced economic impacts). Estimates of these indirect and induced economic benefits that would be generated by the Proposed Action were calculated using an input-output economic model, created by the Governor's Office of Planning and Budget, for Carbon and Emery counties, using purchasing data provided by RGC and earnings values estimated by Woodward-Clyde.

Based on the direct project employment and associated earnings estimates, the Proposed Action would create up to 13 additional new jobs in local area communities during the construction phase of the project. These jobs would represent a net increase above what the project is estimated to have indirectly created in 1996. These would primarily consist of service and trade sector jobs, with a few jobs created in

finance, insurance, and real estate, as well as transportation and public utilities. Since the vast majority of service and retail trade activity occurs in the Price area, it is assumed that most of these new jobs would also be created in Price, or adjacent communities in Carbon County. These new jobs indirectly created and induced by the Proposed Action would comprise both expansion of existing businesses and creation of new businesses. Conversely, after completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production and reclamation phase of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, the economic model has estimated the Proposed Action would indirectly generate up to \$226,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment, but also due to increased transportation and utility employment, construction employment, and finance, insurance and real estate employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$729,000 in indirect earnings per year over the 20 year production and reclamation phase of the project.

Population, Housing, and Community Facilities and Services

Since many of the estimated 50 RGC new year-round workers would be recruited from communities within the Project Area (gradually hired from 1997 through 2006) and the use of local construction workers would remain at current levels during the construction phase of the project, it is likely that only a modest increase in population would occur.

Several new housing developments are being considered in the Project Area that could increase the supply of available housing. Assuming these housing developments are approved, the addition of a modest number of new residents associated with the Proposed Action would not adversely impact the local housing market.

As described in Section 3.15, recent population growth has resulted in increased public school enrollment in Carbon County to the point that many schools are nearing capacity. To the extent project workers are recruited from outside the local area and bring families with school-age children, the Proposed Action would aggravate this shortage of school capacity. The Proposed Action would, however, mitigate the impact of increased demand for school capacity indirectly through payment of about \$7.0 million in ad valorem taxes to the Carbon County School District. These tax dollars could be used by the District toward funding school expansions and/or hiring of additional teachers and staff.

The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years (83 workers). Thus, little or no additional demand for temporary housing would occur in

the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels, recreational vehicles, and mobile homes for housing. As a result, little or no increase in demand on public schools or other community facilities and services from transient construction workers is foreseen.

With respect to law enforcement services, the Carbon County Sheriff's Office has stated it would not patrol the CBM field or provide other routine security services. The sheriff's office would, however, respond to calls on an as needed basis if vandalism or other criminal activity were reported in the CBM field. Thus, no need for an increase in staffing at the Sheriff's Office is foreseen as a result of the Proposed Action (Robertson 1996). In general, RGC employees who work on night shift would patrol the CBM field and provide their own security services. The sheriff's office would only be called in the event of a crime. Thus, the Proposed Action is not expected to increase costs of law enforcement in the Project Area.

Costs and Benefits of the Proposed Project on Local Government Fiscal Conditions

The Proposed Action would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. On balance, total revenues are projected to exceed increased costs by a wide margin.

In terms of actual financial costs, an important potential project-related impact concerns the use of county roads. Within Carbon County, the

government agency that has responsibility for building, improving, and maintaining these roads is the Carbon County Roads Special Service District. In Emery County, this responsibility rests with the Emery County Special Service District #1. Revenues used by these districts is generated through federal mineral lease royalties, state payments in lieu of taxes (PILT), and interest earned on funds not expended. Additional project-related costs to Carbon and Emery Counties would arise from a variety of administrative services and oversight that would be required. From a revenue standpoint, federal mineral lease royalties, ad valorem taxes, and sales and use taxes would all be paid to the counties as a result of the project. Table 4.15-3 provides a table illustrating estimated project costs and revenues to local government fiscal conditions.

Cost of County Road Maintenance

For the proposed project, initial access to considerable portions of the CBM development area from state and federal highways would require the use of county roads and could increase maintenance costs borne by the special districts. The Carbon County Roads Special Service District was contacted to estimate these increased costs. Based on estimated project traffic on paved and non-paved county roads, the proposed project would increase county road maintenance costs by approximately \$140,000 over the life of the project. For Emery County, increased maintenance costs are estimated to be \$68,000 (Table 4.15-3).

In addition, RGC has projected future federal royalty payments that the county road districts

would receive as a result of the proposed project. The estimated royalty payments Carbon County would receive for roads could be as high as \$1 million annually if gas production estimates are accurate. Over the life of the proposed project, federal royalty payments to the Carbon County Roads Special Service District are estimated to be approximately \$10.2 million. Similarly, federal royalties that would be paid to the Emery County Roads Special Service District would be approximately \$4.9 million. Based on those projections, federal royalty payments generated by the proposed project would more than compensate for any increased maintenance costs the counties would have to bear in the future (Table 4.15-3).

County Administrative Costs

The Proposed Action would result in increases in demand for a wide variety of county administrative services. One example includes the mapping, naming, and signing of roads developed in the proposed CBM field to facilitate access for police, fire, and medical emergency services in the event of an emergency. The Carbon County Planning and Zoning Department has estimated its own increase in administrative costs, plus the increased cost to the Building Department and the Geographic Information System (mapping) Department would be approximately \$5,000 and \$10,000 per year, depending on the number of wells developed. Based on this estimate, the total cost of the Proposed Action over a 20-year period would be up to \$200,000 to these county departments. For Emery County, similar costs would arise. Based on the relative scale of development in the Emery County portion of the Project Area, additional costs are estimated to be up to \$100,000 over a 20-year period.

Federal Mineral Royalties

Mineral lease royalties are collected by the BLM for gas produced by CBM wells completed in minerals owned by the BLM. The majority of the CBM wells proposed by RGC (approximately 370 wells) would be completed in BLM-owned minerals and would generate substantial federal mineral royalty payments. Federal mineral royalties are collected at a rate of 12.5% and are split evenly between the federal government and the state where the gas is produced. Utah state law governs how the state's half of the federal royalty payments are divided and distributed. The largest shares of the state's portion of federal royalty payments are distributed to the Permanent Community Impact Fund (PCIF) (32.5%), which is described below, The Regents of the Utah University system (33.5%), and the county where the gas was produced (25%).

Based on estimated gas production rates for the proposed CBM wells, RGC has projected the total royalty on federal wells would be approximately \$121.5 million over the life of the project. Of this amount, about \$60.7 million would be paid to the State of Utah and allocated as described above. As a result, approximately \$19.7 million would be distributed to the PCIF, \$20.4 million would be distributed to the Utah Regents, and \$15.1 million would be distributed to Carbon and Emery Counties. For both Carbon and Emery Counties, this 25% share of the state's federal royalty money is distributed to the County Roads Special Service District. As described previously, it is projected that the Carbon County Roads Special Service District would receive approximately \$10.2 million and the Emery County Roads Special Service District would receive approximately \$4.9 million over the life of the project. Thus, the development of CBM wells on federally-owned minerals would generate fiscal benefits at the federal, state, and local government levels.

State Mineral Royalties and Taxes

Mineral lease payments are also collected by the State of Utah for wells producing on state lands where the State also owns the subsurface mineral rights. In 1995, state royalty payments for RGC wells amounted to \$1.74 million. Over the life of the proposed project, these payments would increase each year until the year 2005, when the project would reach full production. Over the life of the project, it is estimated that approximately \$30.2 million in State royalties would be generated.

State royalties are deposited into the SITLA Permanent Fund. Discussions with SITLA Lands office have confirmed that while royalty payments from wells developed on state-owned minerals in Carbon and Emery Counties are large, a very small portion of those funds actually return to Carbon and Emery County school districts. The primary reason for this is SITLA invests the principal amount collected, rather than distributing it directly. The invested principal returns interest and other investment income. Some of the interest and investment income is reinvested to cover inflation, and the rest is distributed to the counties of Utah, in proportion to the percentage of school age students residing in those counties. Thus, many of the more populated counties along the Wasatch Front receive relatively large percentages of state school trust money, while the rural counties with a small percentage of the state's students receive relatively small percentages. Accordingly, the development of CBM wells on state-owned minerals by RGC would generate relatively small fiscal benefits for Project Area counties, but would benefit the State of Utah as a whole through substantial

contributions to SITLA Lands Permanent Fund.

Severance and Conservation taxes on gas produced by the proposed project would also contribute revenue to the State government. It is estimated that these tax payments associated with proposed wells would be \$300,000 in 1996 and would increase during the construction phase of the project due to increases in production. Over time, as production would decline, this source of revenue would also decline.

The Permanent Community Impact Fund

As described in Section 3.15.2, another important source of revenue that would be contributed by the proposed project that is also related to mineral royalty payments is the Permanent Community Impact Fund (PCIF), which is administered by the State of Utah. In general, the PCIF was established to provide rural communities in Utah that generate federal mineral lease royalties a means of funding major infrastructure projects that benefit them over the long-term. Rather than making the royalties available to communities for general fund expenditure, the PCIF program was created specifically to fund infrastructure projects (Clarke 1996). Cities within the Project Area, such as Price, Helper, Wellington, Huntington, and Castle Dale can apply for grants and low interest loans to fund a variety of infrastructure projects, such as roads, sewer projects, educational institutions, and recreational facilities.

RGC has estimated that royalty payments from the proposed project would contribute approximately \$19.7 million to the PCIF over

the life of the project, which would result in beneficial impacts for cities throughout Utah, including local cities in Carbon and Emery Counties.

The PCIF is a significant source of funds for infrastructure development in the Project Area. From 1991 to 1995, Carbon County cities within the Project Area received approximately \$2.4 million in grants and \$13.2 million in low interest loans from the PCIF for 23 infrastructure projects. Similarly, Emery County cities within the Project Area received approximately \$6.0 million in grants and \$1.0 million in low-interest loans for 19 infrastructure projects. In terms of royalty payments into the PCIF, from 1991 to 1995, Carbon County mining and oil and gas operations contributed about \$6.9 million, while Emery County operations contributed about \$19.8 million, which was the highest in the state. Although counties are generally supposed to receive PCIF funds that correspond with their contributions, some counties pay more than they receive and others receive more than they contribute.

By contributing millions of dollars to the PCIF via federal royalty payments, the Proposed Action would indirectly support future infrastructure projects in cities throughout Utah, including Carbon and Emery counties through PCIF grants and low-interest loans to the local communities, thereby providing long-term benefits to the State that may outlive the project itself.

Local Ad Valorem Tax Revenue

With respect to the cities and counties of the Project Area, another important source of revenue that would be generated by the proposed project would be ad valorem/ property tax that would be levied on improvements constructed by RGC. In 1996, wells and other improvements generated about \$298,000 in ad valorem tax revenue in Carbon County. In the future, this ad valorem tax revenue would be used by the county to fund a variety of services and facilities. Over time, as the number of wells and improvements were increased, ad valorem taxes would increase correspondingly. When the proposed project construction phase would reach Emery County, ad valorem tax revenue would be collected by that county for schools and other facilities and services.

Based on gas reserve predictions, RGC has estimated the future ad valorem taxes the proposed project would generate. Very preliminary estimates of ad valorem taxes that would be paid during the construction phase of the project (through about 2005) amount to approximately \$12.5 million that would be paid to Carbon County, and \$1.9 million that would be paid to Emery County.

For Carbon County, the Carbon School District would be the largest recipient of project-generated ad valorem tax revenue. Over the life of the project, the district would receive approximately \$7.3 million. Similarly, the Carbon County General Fund would receive approximately \$2.9 million. The county could then utilize these funds for additional law enforcement, fire protection, or other community facilities and services. Finally, other service districts in Carbon County, such as the Price River Water District would receive an additional \$2.3 million in ad valorem tax

revenues. For Emery County, the Emery County School District would receive approximately \$1.2 million over the life of the project, while the General Fund would receive about \$423,000, and other service districts, such as the county library, would receive about \$291,000. Table 4.15-3 provides a listing of these revenues, as well as other revenues and costs to local counties over the life of the project.

In Carbon County, estimated payment of ad valorem taxes by RGC would result in an increase of up to 14% in this source of revenue at its peak, relative to 1994. Ad valorem tax payments would continue in the years following, but would decline annually as wells go out of production and the value of equipment depreciates. This eventual decline in revenue in Carbon and Emery Counties could result in reduced funding for community facilities and services, unless other projects and economic growth in general replace declining RGC ad valorem tax revenue. Figure 4.15-2 illustrates preliminary projections of ad valorem tax revenue for both counties over the life of the project.

Sales and Use Tax Revenue

In terms of indirect fiscal impacts, purchasing activity by RGC would generate sales and use tax revenue for the cities and counties of the Project Area and the State of Utah. Although precise purchasing amounts are not available, it is estimated that purchasing activity in the local area would amount to about \$3.8 million annually. Based on a sales tax rate of 5.78% (4.78% state, 1% local), the Proposed Action would generate about \$182,000 in state sales tax revenue and \$38,000 in local sales tax revenue per year in 1996 dollars during the construction phase of the project. Over the life of the project, approximately \$380,000 would be generated, primarily in Carbon County. Local governments in turn would use this tax revenue for providing services and operating community facilities, thereby benefiting local area residents.

In summary, from a fiscal cost versus benefits standpoint, the Proposed Action would contribute millions of dollars to various state and local government entities. Despite costs that would be borne by the counties for road maintenance, the project would result in a large net benefit for local government fiscal conditions. Over time, as production eventually would decline and end, royalties and tax revenues generated would also decline and end.

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

One issue raised regarding the overall benefits and costs of the proposed project is the potential impact to quality of life for Project Area residents associated with lost or degraded recreational opportunities. Given that the proposed project would construct numerous facilities (wells, roads, etc.) in relatively undisturbed areas, there is concern that outdoor recreational experiences enjoyed by local area residents, such as hunting, off road vehicle use, mountain biking, and wildlife observation, would be substantially degraded.

Hunting. Elk and deer hunting is one of the most important recreational activities in the Project Area. It is enjoyed by numerous local area residents, visitors from other parts of Utah, as well as visitors from other states. Hunters from outside of the Project Area generate economic benefits in Price and other local communities due to hunter expenditures on fuel, ammunition and other hunting equipment, motel rooms, meals, and other goods and services. Based on UDWR data, the average hunter expenditure per elk harvested is \$1,075 (assuming \$62 average expenses per day, 2.6 days/permit, and a 15 percent hunter success rate). Similarly, for mule deer, the average hunter expenditure per deer harvested is \$710 (Bates 1996b).

As described previously in Section 4.7, the Proposed Action would impact elk and deer habitat and thereby reduce game populations, if proposed habitat enhancement activities are not successful. With reduced game populations, the UDWR would issue fewer elk and deer hunting tags. These project-related impacts on game

populations could result in a reduction of up to \$154,000 in elk hunting-related income for the local economy annually, and a reduction of up to \$179,000 in deer hunting income annually (\$333,000 combined). Over the life of the project, these reductions in hunting-related business activity could amount to as much as \$6.9 million (Table 4.15-3). It is important to note these values assume game populations are at target/healthy management levels. These reduced hunting impacts are also assuming habitat enhancement mitigation measures would not be successful. In recent years, game populations have been far lower than target levels due to adverse conditions (i.e., drought and severe winters). Thus, the reduction in hunting-related economic activity with the Proposed Action could actually be less than described above. However, since big game populations could rebound naturally over the next 10 years, these calculated impacts are presented as a worst-case scenario. Even if game populations were to reach target management levels, the described economic impact would be mitigated to the extent habitat enhancement activities are successful and game populations are maintained.

In addition to elk and deer, other important game species that are hunted or pursued on a smaller scale include the pronghorn and mountain lion, although the number of hunters that pursue them is considerably smaller than for elk and deer. In 1995, approximately 72 hunter days were recorded in the Project Area for pronghorn and 99 hunter days were recorded for mountain lion. In addition, 175 pursuit days were also recorded for mountain lion pursuits (where lions are tracked, treed and released, not killed) (Mills 1996). Although the number of hunters that visit the Project Area for pronghorn and mountain lion is smaller than for elk and deer, the hunting of these species

also contributes to the local economy, as visitors from outside of the Project Area make expenditures on accommodations, food, fuel, and various supplies in the Project Area. With respect to mountain lion hunts/pursuits, many hunters utilize local guide services and expend considerable amounts of money during their hunts/pursuits. This money is circulated in the local economy, generating economic benefits for the Project Area. As described for deer and elk, potential project impacts to pronghorn habitat and/or mountain lion habitat and prey populations could reduce the number of hunter permits issued and thereby reduce the economic contribution of hunting these species bring to the local economy. The economic impact of reduced pronghorn and mountain lion hunting would be considerably smaller than described for elk and deer, however.

Finally, numerous other types of wildlife are also hunted in the Project Area, although hunting of these species is generally carried out by local area residents. These species include mourning dove, quail, pheasant, waterfowl, coyote, cottontail rabbit, jackrabbit, and prairie dogs. Potential project impacts on the habitats of these wildlife species could reduce their populations, to some extent, and therefore hunter success rates. This would represent a negative impact both from a recreational standpoint, but also from an economic standpoint if local area hunting activity were to decrease and purchases of ammunition and other hunting supplies were to decline. This economic impact would be relatively small compared with elk and deer hunting reductions, however.

Informal Outdoor Recreation. Aside from

hunting, many local residents also enjoy informal recreation activities in the Project Area, such as off road vehicle use, mountain biking, and wildlife viewing. In general, the estimation of costs to the local population due to degradation of informal recreational opportunities is an inexact science, and can be the subject of considerable debate. Although, in many cases, a market does not exist specifically for scenic beauty or pristine recreational opportunities, there are real world examples where market valuation is influenced by such characteristics. Consider, as an example, the increased market value for a home with a scenic view, or that is in close proximity to ski slopes. The market value for a home with one of these characteristics will be higher than for the same home without either of them. This increased value is directly related to the willingness of buyers in the market to pay for scenic views or easy access to ski slopes.

Various studies have been carried out in different parts of the country in an attempt to quantify the loss of value to scenic views or recreational resources due to construction of industrial facilities or other human disturbance. These studies have recognized that wilderness, wildlife, air quality, water quality, and recreationally important lands have considerable value to society, even if a market value can not be readily assigned. These studies have shown that many citizens place a value on wilderness and other recreational resources, whether they intend to use them or not. Conceptually, these studies have found that some individuals value having recreational opportunities available, so they have the option of using the resource when they choose to (option value). Other citizens may choose to never use the resource, but

value the fact that it exists (existence value), similarly, many respondents indicated that although they would not personally use the resource, they wanted their children and other descendants to have the opportunity to visit the resource in the future (bequest value). Examples of these studies include an assessment of the effects of construction of additional coal-fired power plants near Lake Powell. Another addressed the effects of power plant emissions on visibility in the Grand Canyon and the loss of recreational value. These studies involved extensive survey research of recreational users, combined with detailed information on the type and number of recreational visits.

For the proposed project, calculating a value associated with the reduced recreational appeal of the Project Area due to CBM development would require a study specific to the local area. Since no survey research has been conducted of recreational users in the local area, and specific recreational use numbers (e.g., numbers of mountain bikers, birdwatchers, etc.) are not available at this time, a specific dollar value associated with potentially lost or degraded recreational experiences can not be derived at this time. Although a specific dollar value associated with the informal recreational opportunities of the Project Area has not been calculated for this analysis, it is important to acknowledge that non-market sources of economic value exist and that they would be negatively impacted by development of the Proposed Action. Local area residents who recreate in the area proposed for CBM development, or at least value the area in its undeveloped state, would experience this type of loss.

Potential Project Impacts on Tourism and Economic Diversity

Carbon County Future and other organizations have expressed an interest in reducing the dependence of the local economy on the mining and utility industries. These organizations promote economic diversification, including increased tourism, attraction of retirees to the local area, and increased manufacturing. As described in Sections 4.12 and 4.13, development of the Proposed Action would have impacts on outdoor recreation and visual resources of the project area. Given the general economic goal of promoting tourism in Carbon and Emery Counties, concerns have been raised by the public and various local officials that development of CBM resources and resulting impacts to recreation, visual resources, wildlife, and other resources may negatively impact tourism in the Project Area.

While the Proposed Action could reduce the attractiveness of the immediate development area for tourist visits, particularly deer hunters due to potentially reduced game populations, virtually all of the noteworthy tourist attractions in the region (Ninemile Canyon, San Rafael Swell, Cleveland Lloyd Dinosaur Quarry, CEU Prehistoric Museum, etc.) would not be impacted by the project because they are not located in or near proposed CBM development areas. Thus, it is unlikely they would experience a reduction of visitation as a result of the project. Since the Price area provides virtually all of the services to tourists visiting these tourist attractions, stable or even increased tourist visitation of these non-impacted attractions would continue to support the tourism industry in the Price area, despite potential losses in hunting-related tourist visits specifically to the CBM development area.

Recent trends of increased tourist visitation to the region have more to do with increased visitation to the attractions mentioned above and Southeastern Utah as a whole (with pass-through visits to Price) than growth in recreational use of the proposed CBM development area. Interviews and discussions with a wide variety of agencies and individuals familiar with the Project Area have indicated that very little non-local tourist visitation occurs specifically within the CBM development area other than hunting, due to lack of noteworthy attractions or otherwise significant recreational opportunities. The reason for this is the abundance of superior recreational opportunities elsewhere.

While many local area residents enjoy recreating within the proposed CBM development area, the number of tourists who travel to Price specifically to recreate in the CBM development area appears to be modest at best. Thus, aside from big game hunting, the development of CBM resources within the project area is not considered to represent a conflict with established or even potential future tourist visitation and would not preclude future growth of the tourist economy in the Project Area.

With respect to other economic sectors, the project could reduce the attractiveness of Carbon and Emery counties to retirees who could potentially retire in the Project Area. As described subsequently, those who value having quality outdoor recreational opportunities near home would be discouraged from relocating to Carbon or Emery County if the Proposed Action were developed. However, outdoor recreational opportunity is just one factor that

retirees consider in where they locate. Availability of adequate medical facilities, climate, availability of cultural attractions, and other factors can also play a role in attracting retirees to a given community. Thus, it is unclear whether project-related impacts to the CBM development area would preclude attraction of retirees to Carbon and Emery Counties with certainty and to what degree.

Other economic sectors, such as manufacturing, would not be impacted by CBM development such as availability of infrastructure (development site, water, sewer capacity, electric power), presence of a qualified/educated workforce, and access to transportation systems are primary concerns for businesses seeking to relocate. Although many businesses include quality of life and availability of outdoor recreation as factors in choosing where they relocate, metropolitan areas such as Salt Lake City and Denver have been selected by many companies, not only because of outdoor recreational opportunities, but because of the availability of qualified labor and access to efficient transportation systems. Assuming Carbon or Emery Counties can provide adequate infrastructure, the workforce a company needs, and their location is suitable from a transportation standpoint, it is likely companies would relocate there, regardless of development of CBM resources in surrounding areas. Discussions with vendors that serve RGC have indicated some of them may actually relocate to Carbon and Emery Counties as a result of the project.

Property Values

At the present time, there is no literature available that provides specific information on how the development of proposed CBM wells may impact residential property values within the Project Area. Discussions with officials in La Plata County, Colorado, which has experienced similar CBM development in recent years have revealed that impacts on property values vary considerably, depending on proximity of the wells to existing residences. In general, homes that were located in close proximity to CBM wells, where the wells were in plain sight and could be heard suffered the greatest loss in value. In many cases, the noise from CBM wells decreased over time and the effect on neighboring properties also decreased. Homes where wells were somewhat visible in the distance and were barely audible suffered nominal loss of value, and homes where wells were not visible or audible suffered no appreciable impact.

For the overall property tax base of Carbon and Emery Counties, it has been qualitatively estimated that a strong economy resulting from the proposed and other CBM projects, as well as other economic growth in the local area would likely raise overall property values and property tax revenues in the Project Area. The limited number of residences in close proximity to proposed CBM wells (59 within 500 feet) and the potential subsequent loss of property value does not suggest a significant adverse impact on property tax revenue for the counties.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

During the first ten years of the Proposed Action, employment, earnings, and royalties and tax revenues would all increase, relative to current conditions, resulting in beneficial social and economic impacts to the Project Area. However, after construction is completed and gas production in the CBM field declines, project-related employment, earnings, and royalties and tax revenues would decline.

The analysis of the potential for the Proposed Action to cause an economic boom-bust cycle in Carbon and Emery Counties must first place the project in the context of the overall Project Area economy. To accomplish this, estimated project employment figures were compared with 1996 employment figures provided by the Utah Department of Employment Security for the mining sector (which includes oil and gas employment), construction sector, and total non-farm employment for the Project Area.

As described previously, the project would result in a net increase of about 50 local area jobs at project peak, a layoff of about 33 local construction workers in about 2007, and then a loss of about 50 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 2.6% increase in mining/oil and gas employment at project peak, then a 7.4% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. It is important to note that project-related gains and losses in employment are compared with 1996 employment values, which may be considerably different than actual employment values in the future. For example, assuming the construction industry will grow over the next ten years due to other projects in

the local area, the loss of 33 jobs may actually represent a smaller than 7.4% loss in construction sector employment. Conversely, if the construction industry declines in size over the next 30 years, the eventual loss of jobs may be larger than 7.4% of employment in that sector.

Similarly, the construction phase of the project would cause an increase in earnings in the Project Area, relative to current conditions. The completion of the construction phase and eventual depletion of gas in the CBM field would result in declining earnings over time. At project completion, local earnings would drop to zero, resulting in net loss of about \$2.5 million in earnings annually, relative to 1996. This loss of \$2.5 million would represent a 3.5% loss of total earnings for Carbon and Emery Counties as a whole, again assuming total earnings in 2027 would be comparable to 1996. It is assumed total Project Area earnings will be considerably larger in 2027, and thus, the loss of earnings from project completion would be smaller than 3.5%.

Thus, although the Proposed Action would result in an increase and then a decrease in Project Area employment and earnings, compared to current conditions, the relative size of these increases and decreases are small in the context of the overall economy. In addition, with the growth of the service and trade sectors in Carbon County, as well as an increase in tourism in recent years, the economy of the Project Area is more diversified than it was in the 1970s and early 1980s. Accordingly, changes in the mining and utility industries generally have less impact today than they did 15 years ago. In conclusion, although

construction and mineral/gas sector employment and earnings would decline in the later years of the project, it is unlikely that the economy of Carbon and Emery Counties would “bust” as it did in the early 1980s.

The eventual decline in employment and earnings would result in hardship on families no longer employed by the project and would result in reduced tax revenues for local governments. However, the total contribution of the project to the local economy and local government fiscal conditions would have long-term positive impacts on the Project Area, particularly with respect to infrastructure and community facility improvements that would be funded by the project indirectly through tax and royalty payments and PCIF grants from the state.

Although many hardships were experienced in Carbon and Emery counties in the 1980s due to the “energy bust” and general economic downturn, many important community facilities and infrastructure that remain in use today were constructed with revenues generated by the coal and electrical utility industries during their “boom” years. Thus, although the proposed project would not provide permanent employment and revenue benefits past 30 years, it would contribute substantially to the construction of infrastructure and community facilities within the Project Area that may last many years after the project itself has ended.

Applicant Support of the Local Community

Recently, RGC has made financial contributions to the Helper Arts Festival, the air show held at the Carbon County Airport, an Emery County

drug awareness program, and the Rocky Mountain Elk Foundation. In addition, RGC has

donated equipment for lighting the local skating rink, and has

donated various equipment for use at the Carbon County Fairgrounds. Finally, RGC recently sponsored a tree and shrub planting project carried out by local area Boy Scouts.

Although RGC does not have specific plans for sponsoring community events or organizations in the future, company officials have stated an interest in continued sponsorship and/or participation in community events in the future.

Quality of Life Issues

The assessment of impacts to quality of life is a subjective and controversial subject. Opinions, attitudes, and lifestyles vary considerably in the Project Area as do perceptions of potential impacts of the proposed project on quality of life in Carbon and Emery Counties.

For those in the Project Area who strongly value outdoor recreation experiences, such as mountain biking and wildlife viewing, the proposed project would likely degrade the quality of life for those individuals. Similarly, the reduced availability of outdoor recreation opportunities in the local area may reduce its appeal to potential new residents. Section 4.11 describes potential impacts to recreation resources in more detail. Similarly, individuals that would find the sight of CBM facilities and wells in open space areas unattractive may also feel the project would have adverse impacts on their quality of life. RGC would implement mitigation measures that would reduce visual impacts, such as painting CBM facilities colors that blend well with the surroundings. In addition, the maintenance of clean working areas would minimize unsightly debris. These measures would help to reduce potential

impacts to the attractiveness of the Project Area and associated quality of life.

The Project Area has a long history of mining and natural resources extraction and production. Many residents in the Project Area currently derive their livelihoods from coal mining and power plant operations (12 percent in Carbon County, 46 percent in Emery County). In general, the fact that employment in these industries provides higher wages and is the economic base of the region is well understood in the communities of the Project Area. Unlike other areas where a new mine or natural gas development would cause significant changes in the composition and character of local communities, the proposed project would be compatible with other industries that have been established in the Project Area for many decades. For individuals that would be employed directly or indirectly, the project may have beneficial impacts on quality of life. In general, wages that would be paid to project workers would be higher than many of the wages paid to service and trade sector workers in the Project Area. In addition, to the extent the proposed project provides additional tax revenue and royalty income to various local government entities and increases the funding of important community facilities and services, the project could have beneficial impacts on the quality of life in the Project Area.

4.15.2.2 Alternative A

Employment and Earnings

Alternative A would create more construction and RGC company jobs in the Project Area, compared with the Proposed Action. During the

construction phase, local contractor employment would increase by about 50 positions, and transient contractor positions would increase by about 66 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional eight or nine new employees annually to maintain the growing CBM field. At project peak, employment of local area residents would increase by about 155 additional workers, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 209 positions (149 transient contractor jobs and 59 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well. At project completion, when direct employment would drop to zero, the Project Area would experience a net loss of 81 jobs, compared with 1996 (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$4.8 million in 1997, and would increase to about \$6.7 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the project, Alternative A would generate approximately \$134.5 million in direct local earnings in 1996 dollars (Table 4.15-3).

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the localeconomy. Based on direct employment and earnings, as well as project purchasing activity, Alternative A would create up to 23 additional new jobs in

local area communities during the construction phase of the project, beyond what the project created in 1996. As described for the Proposed Action, these jobs would be primarily in the trade and service sectors, and would include both expansion of existing businesses and creation of new businesses. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative A would indirectly generate up to \$407,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$1.3 million in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include approximately 225 workers, which would represent an 80 percent increase above historic levels. This potential increase of 100 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. These types of units are in greater supply than is the case for more permanent types of housing. Since non-local workers would generally not bring their families with them, little or no increase in demand on public schools or other community facilities and services would occur due to these non-local workers.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative A would result in increased costs for the counties in the Project Area, but would also generate benefits for those entities. On balance, total increased revenues would vastly exceed increased costs to the state and local governments. These costs and benefits would both be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use, as well as increased royalty and tax revenues that would be generated.

Alternative A would contribute approximately \$53.2 million in royalties for roads and ad valorem and sales tax revenue to Carbon and Emery Counties over the life of the project. Despite costs that would be borne by the counties for road maintenance and increased administrative burdens (approximately \$908,000), the project would result in an even larger net benefit for local government fiscal conditions. (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be greater in magnitude, due to greater disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$154,000 in elk hunting-related income for the local economy annually, and a \$236,000 reduction in deer hunting income annually (about \$390,000 combined). Over the life of the project, this reduction in hunting-related business activity could amount to as much as \$7.8 million (Table 4.15-3). These values are again based on healthy elk and deer populations

and ineffective habitat enhancement efforts. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative A would actually be less than described above. The more extensive development that would occur under this alternative could also reduce hunting opportunities for other species, such as mountain lion, pronghorn, quail, and the other species described for the Proposed Action.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be somewhat greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance. Impacts to tourism would be modest since Alternative A would not impact

tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative A would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative A would result in a net increase of about 155 local area jobs at project peak, a layoff of about 59 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 16.8% increase in mining/oil and gas employment at project peak, then a 13.3% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future. Actual percentages of jobs gained and lost in their respective industries and compared to the economy as a whole would ultimately depend on their actual size in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the

local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project, despite the sudden jump in unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative A would be the same as those described under the Proposed Action, although with considerably more intensive development, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.3 Alternative B1

Employment and Earnings

Since the number of CBM wells and associated roads would be reduced under this alternative, compared with the Proposed Action, Alternative B1 would create fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would actually be reduced, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment could actually drop by about 19 positions, and transient contractor employment would drop by about 25 positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. However, during that period, RGC would hire an additional three or four new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 11 additional local area workers beyond those currently employed by the project (Table 4.15-1). At the end of the construction phase, total project employment would decline by 81 positions (58 transient contractor jobs and 23 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$1.86 million in 1997, and would increase to about \$2.59 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the

project, Alternative B1 would generate approximately \$53.2 million in direct local earnings in 1996 dollars (Table 4.15-3).

The reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on direct employment and earnings, as well as project purchasing activity, Alternative B1 would create up to 9 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative B1 would indirectly generate up to \$158,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$510,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years. Thus, no additional demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels and mobile homes for housing. No increase in demand on public schools or other community facilities and services is projected.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative B1 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. In general, a net benefit to fiscal conditions is projected as revenues would exceed increased road maintenance and county administrative costs. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated. Approximately \$18.4 million in royalties for roads and ad valorem and sales tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$140,000 in elk hunting-related income for the local economy annually, and a \$80,000 reduction in deer hunting income annually (about \$220,000 combined). Over the life of the project, this reduction in hunting-related business activity could amount to as much as \$4.4 million (Table 4.15-3). These values are again based on healthy elk and deer populations and ineffective habitat enhancement efforts. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative B1 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from certain areas. Impacts to tourism would be modest since Alternative B1 would not impact tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative B1 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be smaller (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative B1 would result in a net increase of about 11 local area jobs at project peak, a layoff of about 19 local construction workers in 1997 and about 23 more in 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to just a 0.5% increase in mining/oil and gas employment at project peak, then about 5.2% in losses of local construction employment in 1997 and 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in an increase and then a decrease in Project Area employment that is even smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for Alternative B1 would be the same as those described under the Proposed Action, although with reduced development, visual impacts and related impacts to quality of life for some Project Area residents would be reduced.

4.15.2.4 Alternative B2

Employment and Earnings

Alternative B2 would create more jobs in the Project Area, compared with the Proposed Action. Furthermore, direct project employment of construction workers and RGC employees would increase, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would increase by about 11 positions, and transient contractor positions would increase by about 15 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional four to six new employees annually to maintain the growing CBM field. At project peak, Alternative B2 would result in a net increase of about 74 jobs for Project Area residents, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 137 positions (98 transient contractor jobs and 39 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area

employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$3.15 million in 1997, and would increase to about \$4.36 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the project, Alternative B2 would generate approximately \$101.3 million in direct local earnings in 1996 dollars (Table 4.15-3).

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the local economy. Based on direct employment and earnings, as well as project purchasing activity, Alternative B2 would create up to 15 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and then completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative B2 would indirectly generate up to \$267,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC

project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$859,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about 148 workers, which would represent an 18 percent increase above historic levels. This potential increase of 23 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. Little or no increase in demand on public schools or other community facilities and services would occur.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative B2 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. Both costs and benefits would be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use; and royalty and tax revenues would be increased. Approximately \$33.9 million in royalties for roads and tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Under Alternative B2, impacts to hunting would be less than described for the Proposed Action because CBM well development would be excluded from important game habitat areas. Impacts to outdoor recreation would generally be greater than the Proposed Action because of the increased number and density of CBM wells in the area that would be developed.

With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$140,000 in elk hunting-related income for the local economy annually, and a \$109,000 reduction in deer hunting income annually (about \$249,000 combined). Over the life of the project, this reduction in hunting-related business activity could amount to as much as \$4.9 million (Table 4.15-3). These values are again based on healthy elk and deer populations and ineffective habitat enhancement efforts. If game populations are lower than target management

levels in the future, the reduction in hunting-related economic activity with Alternative B2 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents

would be somewhat greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance. Impacts to tourism would be modest since Alternative B2 would not impact

tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative B2 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative B2 would result in a net increase of about 74 local area jobs at project peak, a layoff of about 39 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 5.8% increase in mining/oil and gas employment at project peak, then an 8.8% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project, despite the sudden jump in unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative B2 would be the same as those described under the Proposed Action, although with more intensive development overall, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.5 Alternative C1

Employment and Earnings

Since the number of CBM wells and associated roads would be reduced under this alternative, compared with the Proposed Action, Alternative C1 would create slightly fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would be slightly reduced, relative to current conditions, over the entire construction phase of the project. During the construction phase, local contractor employment would drop by about six positions, and transient contractor employment would drop by about eight positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. However, during that period, RGC would hire an additional four or five new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 37 additional local area residents beyond those currently employed by the project (Table 4.15-1). At the end of the construction phase, total project employment would decline by 105 positions (75 transient contractor jobs and 30 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area

employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$2.4 million in 1997, and would increase to about \$3.33 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the project, Alternative C1 would generate approximately \$67.0 million in direct local earnings in 1996 dollars (Table 4.15-3).

The reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on direct employment and earnings, as well as project purchasing activity, Alternative C1 would create up to 12 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative C1 would indirectly generate up to \$203,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect

earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$655,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years. Thus, no additional demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels and mobile homes for housing. No increase in demand on public schools or other community facilities and services is projected.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative C1 would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated. In general, fiscal benefits would exceed costs. Approximately \$26.6 million in royalties and tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$126,000 in elk hunting-related income for the local economy annually, and a \$159,000 reduction in deer hunting income annually (about \$285,000 combined). Over the life of the project, this reduction in hunting-related business activity could amount to as much as \$5.7 million (Table 4.15-3). These values are again based on healthy elk and deer populations and ineffective habitat enhancement efforts. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative C1 would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be slightly less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from certain areas. Impacts to tourism would be modest since Alternative C1 would not impact tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative C1 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be smaller (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative C1 would result in a net increase of about 37 local area jobs at project peak, a layoff of about 6 local construction workers in 1997 and about 30 more in 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to just a 1.6% increase in mining/oil and gas employment at project peak, then about 6.8% in losses of local construction employment in 1997

and 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in an increase and then a decrease in Project Area employment that is even smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for Alternative C1 would be the same as those described under the Proposed Action, although with reduced development, visual

impacts and related impacts to quality of life for some Project Area residents would be slightly reduced.

4.15.2.6 Alternative C2

Employment and Earnings

Alternative C2 would create more jobs in the Project Area, compared with the Proposed Action. Furthermore, direct project employment of construction workers and RGC employees would increase, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would increase by about 43 positions, and transient contractor positions would increase by about 56 positions, compared with current conditions, due to the increase in wells that would be drilled and completed annually. In addition, RGC would hire an additional eight or nine new employees annually to maintain the growing CBM field. At project peak, employment of local area residents would increase by about 139 additional workers, relative to current conditions (Table 4.15-1). At the end of the construction phase, total project employment would decline by 195 positions (139 transient contractor jobs and 56 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$4.49 million in 1997, and would increase to about \$6.21 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the project, Alternative C2 would generate

approximately \$123.5 million in direct local earnings in 1996 dollars (Table 4.15-3).

The expenditure of direct earnings by project workers and purchases of equipment and supplies by RGC generate additional employment and earnings in the local economy. Based on direct employment and earnings, as well as project purchasing activity, Alternative C2 would create up to 22 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative C2 would indirectly generate up to \$380,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$1.2 million in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about 210 workers, which would represent an 68 percent increase above historic levels. This potential increase of 85 non-local workers coming to the Project Area in need of housing would not put a strain on the currently tight rental housing market in the Project Area because temporary housing units, such as motel rooms and mobile homes would generally be used. Little or no increase in demand on public schools or other community facilities and services would occur.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative C2 would result in some costs for the counties in the Project Area due to increased road maintenance and administrative costs, but would also generate greater benefits for those entities. These costs and benefits would both be greater in magnitude than for the Proposed Action due to the increase in the number of wells and associated truck traffic and road use, as well as increased royalty and tax revenues that would be generated. In general, the fiscal benefits would greatly exceed increased costs in the Project Area. Approximately \$47.5 million in royalties and tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Under Alternative C2, exclusion of development from small critical habitat areas would slightly reduce the impacts to elk hunting relative to the Proposed Action, but would increase the impact to deer hunting and outdoor recreation relative to the Proposed Action because of the increased number and density of CBM wells in the area that would be developed.

With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$140,000 in elk hunting-related income for the local economy annually, and a \$199,000 reduction in

deer hunting income annually (about \$339,000 combined). Over the life of the project, this reduction in hunting-related business activity could amount to as much as \$6.8 million (Table 4.15-3). These values are again based on healthy elk and deer populations and ineffective habitat enhancement efforts. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with Alternative C2 would actually be less than described above.

With respect to outdoor recreation, impacts

associated with reduced or degraded recreational opportunities to local area residents would be greater than described for the Proposed Action, due to the increased number and density of CBM wells, and related visual and truck-related disturbance. Impacts to tourism would be modest since Alternative C2 would not impact tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative C2 would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be greater (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative C2 would result in a net increase of about 139 local area jobs at project peak, a layoff of about 56 local construction workers in about 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to a 14.8% increase in mining/oil and gas employment at project peak, then a 12.6% loss of local construction employment in 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Although this alternative would result in an increase and then a decrease in Project Area employment even greater than under the Proposed Action, given the diversification of the local area economy in recent years, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project, despite the sudden jump in unemployment in the construction industry anticipated.

Quality of Life Issues

The issues associated with a quality of life for Alternative C2 would be the same as those described under the Proposed Action, although with more intensive development overall, visual impacts and related impacts to quality of life for some Project Area residents would be even greater.

4.15.2.7 Alternative D

Employment and Earnings

Since the number of CBM wells and associated roads would be reduced under this alternative, compared with the Proposed Action, Alternative D would create slightly fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would be slightly reduced, relative to current conditions, over the entire construction phase of the project. During the construction phase, local contractor employment would drop by about six positions, and transient contractor employment would drop by about eight positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. However, during that period, RGC would hire an additional four or five new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 37 additional local area residents beyond those currently employed by the project (Table 4.15-1). At the end of the construction phase, total project employment would decline by 105 positions (75 transient contractor jobs and 30 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$2.4 million in 1997, and would increase to about \$3.33 million at project peak in 2006, compared with about \$2.5 million in 1996. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the

project, Alternative D would generate approximately \$66.5 million in direct local earnings in 1996 dollars (Table 4.15-3).

The reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on direct employment and earnings, as well as project purchasing activity, Alternative D would create up to 12 additional new jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and completion of the project.

Similarly, the indirect/induced creation of jobs would generate additional earnings in the local economy that would also be spent in the local area. Based on project-related earnings and purchasing activity, Alternative D would indirectly generate up to \$203,000 in additional earnings per year during the construction phase of the project above and beyond what the RGC project is currently generating. These indirect earnings would be generated primarily due to the increased service and trade sector employment. After completion of project construction, the reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a net loss of up to \$655,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that only a modest increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include about the same number of workers that have been used in recent years. Thus, no additional demand for temporary housing would occur in the future. The vast majority of transient construction workers brought in from outside of the Project Area would not bring their families with them and would generally utilize motels and mobile homes for housing. No increase in demand on public schools or other community facilities and services is projected.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

Alternative D would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. These costs and benefits would both be smaller in magnitude than for the Proposed Action due to the reduced number of wells and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated. In general, fiscal benefits would exceed costs. Approximately \$27.2 million in royalties and tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$98,000 in elk hunting-related income for the local economy annually, and a \$179,000 reduction in deer hunting income annually (about \$277,000 combined). Over the life of the project, those reductions in hunting-related business activity could amount to as much as \$5.5 million (Table 4.15-3). These values are again based on healthy elk and deer populations and ineffective habitat enhancement efforts. If game populations are lower than target management levels in the future, or habitat enhancement mitigation measures are effective, the reduction in hunting-related economic activity with Alternative D would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be slightly less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from certain areas. Impacts to tourism would be modest since Alternative D would not impact tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

The issues associated with a potential boom-bust cycle for Alternative D would be the same as those described for the Proposed Action, although the increase in the number of jobs for local residents at peak of the boom period, and the number of jobs eventually lost would be smaller (Table 4.15-1) (Figure 4.15-1).

As described previously, Alternative D would result in a net increase of about 37 local area jobs at project peak, a layoff of about 6 local construction workers in 1997 and about 30 more in 2007, and then a net loss of about 81 local area jobs at project completion in 2027 (Table 4.15-1). These employment impacts equate to just a 1.6% increase in mining/oil and gas

employment at project peak, then about 6.8% in losses of local construction employment in 1997 and 2007, and eventually a 3.5% loss in mining/oil and gas sector employment at project completion. Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in an increase and then a decrease in Project Area employment that is even smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for Alternative D would be the same as those described under the Proposed Action, although with reduced development, visual impacts and related impacts to quality of life for some Project Area residents would be slightly reduced.

4.15.2.8 No Action Alternative

Employment and Earnings

Since the number of CBM wells and associated roads would be substantially reduced under this alternative, compared with the Proposed Action, the No Action alternative would create fewer jobs in the Project Area over the life of the project. Furthermore, direct project employment of construction workers would be reduced, relative to current conditions over the entire construction phase of the project. During the construction phase, local contractor employment would drop by about 35 positions, and transient contractor employment would drop by about 46 positions, compared with current conditions, due to the reduction in wells that would be drilled and completed annually. During that period, RGC would hire an additional two new employees annually to maintain the growing CBM field. At project peak, RGC would employ about 13 additional local area workers beyond those currently employed by the project, although total local resident employment, including local construction workers, would be 22 positions fewer than in 1996 (Table 4.15-1). At the end of the construction phase, total project employment would decline by 52 positions (37 transient contractor jobs and 14 local contractor jobs lost). Over the following 20 years, as wells go out of production, RGC employment would gradually decline as well (Figure 4.15-1).

Direct project earnings for local area employees, along with transient contractor per diems that would be spent in the local economy would amount to approximately \$1.20 million in 1997, and would increase to about \$1.66 million at project peak in 2006, compared with about \$2.5 million in 1996. Thus, even at project peak,

the No Action alternative would generate fewer earnings than under current conditions. After 2006, earnings would decline due to the abrupt loss of construction jobs and gradual reduction of employment of RGC CBM field workers. Over the life of the project, the No Action alternative would generate approximately \$27.8 million in direct local earnings in 1996 dollars (Table 4-15.3).

The considerable reduction in wells that would be drilled, and associated employment and earnings, would also result in smaller indirect and induced economic impacts on the Project Area as well. Based on the reduction in direct employment and earnings, as well as project purchasing activity, the No Action alternative would result in a decline of about 10 jobs in local area communities during the construction phase of the project, beyond what the project created in 1996. After completion of project construction, the reduction in direct employment and earnings would indirectly result in a reduction of service and trade sector jobs. Compared with current conditions, the Project Area would experience a net loss of about 54 service and trade sector jobs over the 20 year production phase and then completion of the project.

Similarly, the indirect/induced loss of jobs due to project reduction, would reduce earnings in the local economy in the local area. Based on project-related earnings and purchasing activity, the No Action alternative would result in a loss of about \$150,000 in earnings per year during the construction phase of the project, relative to what the project is currently generating. After completion of project construction, the further reduction in direct earnings would indirectly result in a reduction of service, trade, and other job sector earnings. Compared with current conditions, the Project Area would experience a

net loss of up to \$328,000 in indirect earnings per year over the 20 year production phase of the project.

Population, Housing, and Community Facilities and Services

Since the majority of new year-round workers would be recruited from communities within the Project Area, it is likely that little or no increase in population would occur. The proposed use of non-local construction workers for specialized construction activities would include fewer workers than have been used in recent years. Thus, there would be a decrease in demand for temporary housing in the future. There would be no impact to public schools or other community facilities and services under this alternative.

Costs and Benefits of the Proposed Project and Local Government Fiscal Conditions

The No Action alternative would result in some costs for the counties in the Project Area, but would also generate benefits for those entities. These costs and benefits would both be substantially reduced in magnitude relative to the Proposed Action due to the reduced number of wells on federal lands and associated truck traffic and road use, as well as decreased royalty and tax revenues that would be generated. Approximately \$6.8 million in royalties and tax revenue would be generated for local counties over the life of the project (Table 4.15-3).

Estimating the Economic and Quality of Life Costs Associated With the Degradation of Outdoor Recreational Opportunities

Impacts to hunting and other outdoor recreation opportunities would be similar in nature to those described for the Proposed Action, but would be considerably smaller in magnitude, due to reduced disturbance of game habitat and areas used for outdoor recreation. With respect to hunting, using the same assumptions described for the Proposed Action, project-related impacts on game populations would result in a reduction of about \$84,000 in elk hunting-related income for the local economy annually, and a \$80,000 reduction in deer hunting income annually (about \$184,000 combined). Over the life of the project these reductions in hunting-related business activity could amount to as much as \$3.3 million (Table 4.15-3). These values are again based on healthy elk and deer populations. If game populations are lower than target management levels in the future, the reduction in hunting-related economic activity with the No Action alternative would actually be less than described above.

With respect to outdoor recreation, impacts associated with reduced or degraded recreational opportunities to local area residents would be considerably less than described for the Proposed Action, due to the decreased number of CBM wells and exclusion from areas managed by the BLM. Impacts to tourism would be modest since the No Action alternative would not impact tourist attractions that draw visitors to the local area.

Potential Adverse Impacts of an Economic Boom-Bust Cycle

Given the considerably smaller scale of the No Action alternative, employment would actually be reduced, relative to current conditions over the entire life of the project. Hiring by RGC during the construction phase, and then subsequent reductions in employment would be smaller in scale than for the Proposed Action and other alternatives (Table 4.15-1) (Figure 4.15-1).

Even at project peak, the project would result in a net reduction of 22 jobs for local workers (0.9% of total mining/oil and gas and construction employment), compared with current conditions. After completion of the modest construction phase, about 14 local construction jobs would be lost (3.2% of the construction industry), and then a net loss of 81 positions at project completion (3.5% of total mining/oil and gas and construction employment). Again, the project-related gains and losses in employment presented have been compared with 1996 employment values, which may be considerably different than actual employment values in the future.

Since this alternative would result in employment impacts that would be considerably smaller than under the Proposed Action, it is unlikely that the economy of Carbon and Emery Counties as a whole would “bust” as it did in the early 1980s as a result of the project.

Quality of Life Issues

The issues associated with a quality of life for this alternative would be the same as those described under the Proposed Action, although with significantly reduced development on state and private lands only, visual impacts and related impacts to quality of life for some Project Area residents would be reduced considerably. With the reduced scale of the project, the number of new job opportunities for local area residents would also be reduced.

4.15.3 Impacts Summary

A summary comparison of impacts of the Proposed Action and alternatives is provided in Table 2.8-2.

With the exception of the No Action alternative, all of the project alternatives would result in additional employment in the Project Area beyond current conditions, although the numbers of jobs and related earnings vary by alternative (Table 4.15-2). Most of the project workers would be recruited from the Project Area, so

the potential influx of workers and associated population increase would be modest in scale. Accordingly, only modest increases in demand for community facilities (such as schools) and services (such as police and fire protection) is anticipated for all project alternatives. Earnings generated by the project would be spent in the Project Area economy for housing, food, and goods and services, thereby creating additional trade and service sector jobs and earnings.

The proposed project and all alternatives would generate substantial revenue for the state and various local government entities through payment of royalties and taxes. These payments or fiscal benefits would vastly exceed any costs the project would have on local services, such as county road maintenance and administrative services. These revenues would be used by the cities and counties for funding a variety of services and possibly the development of new community facilities and infrastructure in general. Although the rise and fall of project

employment, earnings, and government revenues could be perceived as creating another boom-bust cycle, the scale of employment and earnings impacts is small, relative to the local economy as a whole. To the extent the project's revenue contributions would finance infrastructure and other community facilities, it would generate long-term benefits that would last well beyond the end of the project itself. Reduction in hunting opportunities due to impacted game populations, as well as reduction in the quality of outdoor recreation experiences would have additional negative economic impacts on the local communities. These impacts would vary by alternative.

In terms of quality of life issues, some residents of the Project Area perceive the development of the CBM field as degrading recreational opportunities in the Project Area and overall quality of life, while others value the creation of new jobs that pay relatively good wages as an important factor in their quality of life.

4.15.4 Mitigation

In addition to conforming with Visual Resource Management objectives in the project development area, a commitment by RGC to maintain clean working areas would minimize unsightly debris and perceived degradation of the Project Area. This mitigation measure would help to reduce potential impacts to the attractiveness of the Project Area and associated quality of life for those concerned. Moreover, the hiring of local workers to the maximum extent possible would minimize the influx of new population and associated demand on schools and other community facilities and services.

4.15.5 Unavoidable Adverse Impacts

Impacts to quality of life would occur with all of the project alternatives under consideration. Residents who value having local and convenient recreational opportunities and those who value the appearance of undeveloped open land surrounding their communities would experience adverse impacts to their quality of life. While various mitigation measures could reduce the severity of impacts to recreation and the aesthetics of the proposed CBM development area, these measures are unlikely to completely mitigate impacts.

4.16 HEALTH AND SAFETY

4.16.1 Introduction

Potential risks associated with implementation of well field development under any of the alternatives would include:

I. Geologic Hazards

- II. Methane Gas Seepage
- III. Hydrogen Sulfide Releases
- IV. Abnormal High Pressure
(blowouts)
- V. Seismic Activity
- VI. Fires and Explosions
- VII. Gas Flowline Leakage or Rupture
- VIII. Well Fires
- IX. Human-caused Wildlife
- X. Public and Employee Safety
- XI.

4.16.2 Direct and Direct impacts

4.16.2.1 Proposed Action

Geologic Hazards

Geologic hazards are discussed in detail in Section 1.6.2. The following is a brief summary.

- I.** Methane Gas Seepage - Since all wells would be cased and cemented, methane seeps to surface soils would be prevented and no impacts are expected. USGS, under the direction of UDOGM is monitoring methane concentrations in groundwater and soils to determine if seepage is occurring as a result of the CBM projects.
- II.** Hydrogen Sulfide Releases - Hydrogen sulfide (H₂S) has not been encountered to date while drilling over 100 CBM wells, and it is highly unlikely that H₂S would be encountered while drilling any CBM well in the area.
 - a) RGC would have a trained safety specialist on site to monitor for H₂S. In addition, a written contingency plan would be required to be in effect whenever workover operations are in progress. RGC employees and subcontractors are trained to deal with an H₂S release, and safety equipment would be at each drill site where H₂S may be encountered.
- III.** Abnormal High Pressure (Blowouts) - Nearly 100 CBM wells have been drilled in the Project Area without experiencing abnormally high pressure. Blowouts are considered unlikely in the Price CBM

Project Area because of the shallow well depths, low gas pressures, past experience in the area, and BLM and UDOGM requirements for the use of Blowout Prevention Equipment (BOPE). All wells drilled would be required to have BOPE to control any abnormal pressures encountered. UDOGM would make inspections during drilling activity to verify compliance with these requirements. In addition, RGC drilling crews are certified with blowout prevention training.

- IV.** Seismic Activity - Maps of seismic risk for the United States indicate this portion of Utah is at a relatively low risk (Keller 1982). Relatively minor earthquakes of up to a magnitude of 4 on the Richter Scale have been recorded in the vicinity of the proposed project. The intensity that is usually associated with a magnitude 4 earthquake can be compared to the “vibration of a passing truck” (Keller 1982). Earthquakes of this minor intensity are not likely to affect the integrity of wells, pipelines, or other surface facilities.

Fires and Explosions

- I.** Gas Flowline Leakage or Ruptures - The potential for natural (CBM) gas flowline/pipeline leaks or ruptures exists for the proposed project. According to the DOT, an average rupture frequency of 1 rupture per 5,000 miles of pipeline could be expected. Most ruptures are the result of heavy equipment accidentally striking the pipeline while operating in close proximity to the gas pipeline. Such ruptures could lead to a fire and/or explosion should a spark or

open flame ignite the gas being released from the rupture.

a) Pipeline design, materials, construction, operations, maintenance, and abandonment practices would be conducted in accordance with safe and proven engineering practices and would meet or exceed the DOT regulations (49 CFR Part 192, Transportation of Natural and Other Gas by Pipelines: Minimum Federal Safety Standards) and standard construction specifications recommended by the American Society of Mechanical Engineers (ASME-31.8) and the American Petroleum Institute (API Standard 1004). Adherence to these standards during construction and testing would likely reduce the potential for leaks or pipeline failure to a minimal probability. Frequent signing of gas pipeline ROW and placement of colored warning tape above the pipeline in the trench would reduce the risk of accidental ruptures from excavating equipment.

b) RGC would have a leak detection program in place as described in the environmental protection measure, RGC 3 (refer to Section 2.2.5.1).

II. Well Fires and Explosions - Well fires are very rare, but under certain conditions, could occur. A well fire could result from a blowout during drilling activities, or a gas leak during operations. Gas would have to accumulate, such as in a confined space, and there would have to be a spark or source of ignition to start the fire (Hunt 1997). Since a blowout is unlikely (see Geologic Hazards above), it is also unlikely that all these conditions would occur at the same time and result in a well fire or explosion in the Price CBM Project Area. In the event of a well fire, RGC would call

one of several service companies specializing in controlling well fires, not the county fire department.

III. Human-caused Wildfire - The BLM recognizes that increased human use of lands within the Project Area can lead to increased risk of wildfire. Use of the area by construction crews and the general public is of concern; however, construction and operating personnel would be required to adhere to fire prevention measures in all authorized activities (Appendix 2D). Use of the area by the general public should not lead to an increased risk of fire. All wildfires endangering life or property will be suppressed.

Public and Employee Safety

Public Safety

I. Siting Wells near Residential Areas - BLM Lease Category 3 - No Surface Occupancy has stipulations on federal leases restricting drilling from within incorporated cities (Appendix 1B). There are no other lease stipulations requiring a buffer zone from dwellings. Additionally, neither UDOGM, Carbon County, or Emery County have established regulatory setbacks or buffer zones from CBM wells to residences. Refer to Section 4.10 for an analysis of the number of residences in close proximity to proposed project activities.

RGC has taken certain measures to minimize risks at existing facilities and would continue to do so should the Proposed Action or any of the alternatives be approved. These safety measures include fencing all compressor stations, injection wells, and evaporation ponds. Wellpads and pump jacks would have a

guard railing around them to prevent large animals and people from being injured by

moving parts. Some pump jacks may be

fenced or be enclosed in a building to increase public safety.

Vandalism at wells has a small potential for causing a fire, but is highly unlikely to result in an explosion because of low gas pressures. Warning signs have been placed at all major facilities and some wells. RGC is continuing to put up warning signs at all existing wells, and all new facilities would also have warning signs. RGC night shift personnel patrol the CBM field to provide increased security.

Employee Safety

Risks associated with construction of wellsites, access roads, pipelines, electrical distribution lines, and ancillary facilities, and well drilling, completion, and production operations would approximate impacts associated with heavy construction and industry. During 1992, a total of 12,100 workdays were lost in the oil and gas extraction industry (U.S. Department of Labor 1994). Of this total, 2,600 days were lost in the area of crude petroleum and natural gas production; the remaining 9,500 lost workdays occurred in the oil and gas field services area. Injury- and illness-related lost workdays for the oil and gas industry were nearly double the rate for similar activities in the mining industry. These potential risks associated with the oil and gas industry would be limited to employees and subcontractors and would not affect the public. Issues and concerns regarding increased traffic on field development and public roads are addressed in Section 4.10 of this EIS.

RGC to date has had no deaths or reportable injuries on the job, as defined by OSHA. The construction contractor for

the compressor station did have one accidental death. RGC has an Emergency Plan that is in conformance with OSHA requirements. The Plan covers all potential emergencies including fires, employee injuries, chemical releases, hydrogen sulfide releases, and many others. The Plan also includes phone numbers for all medical and emergency services, and a list of responsible personnel to contact in an emergency situation. The Plan is posted at all major facilities and is also kept in all employee vehicles. In addition, all employees are trained in emergency response when they are hired, and take refresher training once a year thereafter. Subcontractors working on the site are also trained and carry the Emergency Plan with them at all times. RGC has worked closely with local hospitals, fire departments, and emergency personnel to coordinate and prepare for any potential emergency.

4.16.2.2 Alternatives A, B1, B2, C1, C2, D, and No Action

Risks/impacts from construction, operations, and abandonment of the well field would be similar to those described for the Proposed Action; however, the probability of incidence would change by alternative due to the level of development associated with each alternative. The following is the expected change in probability of incidence by alternative:

Alternatives, A, B2 and C2 - small increase due to greater level of development.

Alternatives B1, C1, D and No Action - small decrease due to reduced level of development.

4.16.3 Impacts Summary

A summary comparison of impacts of the Proposed Action and alternatives is provided in Table 2.8-2.

Hazards associated with the well field development program, including construction, operations, and abandonment activities, are those hazards normally associated with the oil and gas extraction industry. A minimal risk to the public would exist from the spread of wildfire accidentally initiated by industry employees or contractors; however, the risk would be minimized by the relative absence of public habitation in proximity to proposed CBM facilities.

4.16.4 Mitigation

As the potential risks to health and safety would be minimal for the Proposed Action and alternatives, no additional mitigation measures beyond those presented or referenced in Section 2 would be required.

4.16.5 Unavoidable Adverse Impacts

Minimal risks to the health and safety of primarily CBM workers, and to a lesser extent, the public would be present for the life of the project.