4.0 - ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This chapter provides an analysis of the environmental consequences from implementation of the Proposed Action (Alternative A), Alternative B (the No Action Alternative), and Alternative C (Limited Surface Disturbance within Sensitive Resource Areas). Applicant-Committed Environmental Protection Measures and additional environmental protection measures that would avoid or reduce impacts under Alternative A and/or C have been included in Chapter 2 of this EA, and the analyses in this chapter assume that those measures would be implemented.

Direct impacts to resources, those that are caused by the action and occur at the same time and/or place (40 CFR 1508.8), in the following analyses are described in terms of initial impacts from construction and development activities. In areas where interim reclamation is implemented, ground cover by herbaceous and woody species could re-establish within 7 to 8 years following seeding of native plant species and diligent weed control efforts. However, it is important to note that recent BLM monitoring has documented that reclamation efforts for oil and gas development have largely been unsuccessful at reestablishing soil stability, vegetation, and subsequent forage for wildlife and livestock due to poor soils and drought. BLM field inspections show that initial impacts may be more accurately portrayed as long-term impacts. All surface disturbance proposed under the alternatives, therefore, could remain as long-term (or even permanent) impacts on the landscape if reclamation efforts are not successful.

4.2 GEOLOGY AND MINERALS

4.2.1 ALTERNATIVE A - PROPOSED ACTION

4.2.1.1 Geology

Potential impacts to geologic resources from the Proposed Action include changes to the local topography and increased slope instability. Excavation for the construction of well pads, pipelines, and access roads would cause topographic changes including square- or rectangular-shaped cuts and fills in the sandstone and sandy shale bedrock underlying the Project Area. These changes to the topographic character of the area would be long-term, but localized.

The potential for increased landslide activity from the Proposed Action is considered to be minor because none of the rock units exposed in the area have a high potential for mass movements. Some small slumps may occur in the cuts created for the new access roads, pipelines, and well pads. However, these movements are expected to be localized in extent. Slumping would most likely occur following rainstorms or during snowmelt.

4.2.1.2 Mineral Resources

Oil and Gas

Potential impacts to oil and gas resources include the depletion of these resources due to active extraction under the Proposed Action. The expected life of the project is approximately 20 to 30 years. Although estimates of the ultimate recovery of gas are not available, depletions of recoverable gas from the Wasatch Formation and Mesaverde Group underlying the Project Area from the proposed 664 new gas wells would be substantial. This irreversible commitment of resources would be economically beneficial to the general public during the life of the project. Gas resources within the deeper Dakota Sandstone,

Cedar Mountain Formation, Mancos Shale, Morrison Formation, Entrada Formation, and Wingate Sandstone would remain for future extraction.

Tar Sands

A small portion of the PR Springs STSA located within the Project Area could be made unavailable for tar sands development. However, since less than 1 percent of the PR Springs STSA is located in the southern portion of the Project Area, the potential impacts to tar sands production from the Proposed Action are considered to be negligible.

Oil Shale

Development of the Proposed Action could conflict with future oil shale development in the western portion of the Project Area. Given the fact that many other areas within the Uinta and Piceance Basins contain oil shale of better quality that is closer to the surface, the potential conflicts within a portion of this KOSLA are considered to be minor.

Other Mineral Resources

Sand and gravel deposits are located along several dry washes within the Project Area. None of these deposits are currently mined. Small amounts of gravel may be used from existing sources for road construction. The amount of gravel that may be used cannot be quantified.

A small portion of the Buck Canyon building stone collection area is located within the Project Area. No wells are proposed within this area and, therefore, potential impacts are not anticipated from the Proposed Action.

Coal resources are located at depths of greater than 2,000 feet and are not economical. Therefore, the Proposed Action would have no impacts on coal resources.

4.2.2 ALTERNATIVE B – NO ACTION

4.2.2.1 Geology

Impacts to the local topography are expected to be of the same type as described for the Proposed Action (**Section 4.2.1.1**), but are expected on a much smaller scale proportional to the decreased level of expected surface disturbance. The potential increase in areas with slope stability problems would be about one-fifth of that for the Proposed Action.

4.2.2.2 Mineral Resources

Oil and Gas

Under the No Action Alternative, depletion of oil and gas resources from the Wasatch Formation and Mesaverde Group would occur at a much lower rate than under the Proposed Action. It is estimated that the majority of the gas resources in these formations beneath the Project Area would remain available for future extraction.

Tar Sands

The main portion of the PR Springs STSA is located south of the Project Area. As less than one percent of the STSA is located within the Project Area, similar to the other alternatives, the potential impacts to tar sands production from the No Action Alternative are considered to be negligible.

Oil Shale

Potential conflicts with oil shale development under the No Action Alternative would be similar to those discussed under the Proposed Action, but the amount of land potentially impacted would be about one-fifth of the Proposed Action.

Other Mineral Resources

Sand and gravel deposits are located along several dry washes within the Project Area. None of these deposits is currently mined. Small amounts of gravel may be used from existing sources for road construction. The amount of gravel potentially used cannot be quantified.

No impacts to the Buck Canyon collection area are expected under the No Action Alternative.

Coal resources are located at depths of greater than 2,000 feet and are not considered economical. Therefore, the No Action Alternative would have no impacts on coal resources.

4.2.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

4.2.3.1 Geology

Potential changes to the local topography and the potential increase in areas with slope stability problems would be similar in nature to those described under the Proposed Action, but slightly smaller in magnitude proportional to the slightly less surface disturbance.

4.2.3.2 Mineral Resources

Oil and gas

Under Alternative C, depletion of oil and gas resources from the Wasatch Formation and Mesaverde Group would proceed at the same rate as under the Proposed Action.

Tar Sands

Potential impacts to tar sands production from Alternative C would be the same as for the Proposed Action.

Oil Shale

Under Alternative C, potential conflicts with oil shale development could exist as described under the Proposed Action.

Other Mineral Resources

Sand and gravel deposits are located along several dry washes within the Project Area. None of these deposits is currently mined. Small amounts of gravel may be used from existing sources for road construction. The amount of gravel potentially used cannot be quantified.

No impacts to the Buck Canyon collection area are expected under Alternative C.

Coal resources are located at depths of greater than 2,000 feet and are not considered economical. Therefore, Alternative C would have no impacts to coal resources.

4.2.4 MITIGATION MEASURES

No additional mitigation measures are proposed for protection of geologic and mineral resources.

4.3 AIR QUALITY AND CLIMATE

4.3.1 ALTERNATIVE A – PROPOSED ACTION

Project-related emissions have the potential to affect air quality on both a local and a regional scale. Emission inventories for criteria pollutants [nitrogen oxides (NO_x), carbon monoxide (CO), sulfur dioxide (SO_2), and particulates (PM_{10} and $PM_{2.5}$)], volatile organic compounds (VOC), and hazardous air pollutants (HAP) [benzene, toluene, ethylbenzene, xylene (BTEX), n-hexane, and formaldehyde] were completed for development and operational-related activities. Pollutant dispersion modeling was performed using the Industrial Source Complex (ISC) dispersion model in conjunction with meteorological data collected at Bonanza Deseret Power Plant (UDEQ-DAQ 1998) and pollutant emission inventories, to assess the potential ambient air quality impacts from the Proposed Action.

The analysis predicted criteria pollutant air quality concentrations from short-term activities such as well pad and road construction, well drilling, and well completion activities. The analysis also predicted HAP and criteria pollutant concentrations during full-field operation. Potential impacts were evaluated by comparing predicted pollutant concentrations with the air quality criteria described in **Section 3.3.**

4.3.1.1 Proposed Action Emission Inventory

An annual emission inventory was developed for the Proposed Action representing the average level of emissions that would be released on an annual basis during well development and operations over the life of the project. Emission rates were calculated using applicable EPA emission factors and anticipated level of operational activities, such as estimated vehicle trips, load factors, and hours of operation. These derived emission rates were then applied in conjunction with the ISC dispersion model in order to evaluate project impacts against air quality evaluation thresholds.

Emissions would result from the following project activities and sources:

- Well pad and road construction: earth-moving equipment fugitive dust, earth-moving equipment exhaust, and mobile source tailpipe emissions on access roads;
- Drilling: mobile source tailpipe emissions, fugitive dust emissions on access roads, and drill rig engine exhaust;

- Completion: mobile source tailpipe emissions, fugitive dust emissions on access roads, well venting emissions, and well fracturing engine emissions;
- Well pad operation: dehydrator still-vent emissions, separator and dehydrator heater emissions, and flashing, working, and breathing emissions from condensate tanks;
- Gas processing: central dehydrator emissions, natural gas-driven compressor engine emissions, mobile source tailpipe emissions, and fugitive dust emissions on access roads; and
- Operation and maintenance: mobile source tailpipe emissions and fugitive dust emissions on access roads.

All temporary development-related emission calculations, which include well location and access road construction, well drilling, and well completion, are based on a development period of 11 years (the average of the estimated construction and drilling period: 10 to 12 years). Pad and access road construction fugitive dust emission calculations assumed a 50 percent watering control efficiency while vehicle-generated fugitive dust calculations incorporated dust reduction factors from precipitation events. Annual emissions which are assumed to continue for the 25-year life-of-project are estimated after all facilities have been constructed and are fully operational.

4.3.1.2 Proposed Action Impacts

Well Development Impacts

Well development air quality impacts represent those that would occur during each phase in the development of a single well (construction, drilling, and completion). Each phase of development was modeled separately to determine the maximum impacts. A well location and adjoining unpaved access road were included in this analysis. Modeling assumed that up to two adjacent locations could be constructed, drilled, or completed simultaneously. Based on the proposed project schedule, the time to construct, drill, and complete a well would average five days, 10 days, and 15 days, respectively. It was assumed that construction and completion activities would occur 10 hours per day while drilling activities would occur 24 hours per day.

The pollutant emitted in the greatest quantities during well development would be PM_{10}. Maximum hourly emissions of PM_{10}, NO_x, and SO_2 were estimated and used for comparison to applicable short-term and annual ambient air quality standards. Comparison to annual NO_2, PM_{10} and SO_2 NAAQS standards is provided for consistency. However, the annual impacts are conservative in that they assume annual emissions allocated to the same locations for the entire development period, which is not the case. Since development activities are temporary, short-term activities, a comparison to PSD thresholds is not appropriate.

The maximum development impacts are presented in **Table 4.3-1**. It is important to note that these impacts are localized and temporary in nature and would decrease substantially with distance from the immediate activity. Impacts from other activities in adjacent fields would be sufficiently separated by distance and time such that short-term impacts should not overlap with each other.

As shown, expected ambient air concentrations would be below all NAAQS standards for the length of development. Annual impacts are not applicable because all development operations at each location would only occur for 30 to 45 days.

Table 4.3-1. Proposed Action Development Phase Impacts[a]						
Pollutant and Averaging Period	Averaging Period	Ambient Air Concentration ($\mu g/m^3$)[b]				
		Predicted	Background[c]	Total	NAAQS	% of NAAQS (Project + Background)
SO_2	3-Hour	74	20	94	1,300	7 %
	24-Hour	13	10	23	365	6 %
PM_{10}	24-Hour	27	28	55	150	36 %
$PM_{2.5}$	24-Hour	6.5	25	31.5	35	90 %

[a] Impacts presented are maximum construction, drilling, and completion phase
[b] μ/m^3 is micrograms of pollutant per cubic meter of air
[c] Source: (UDEQ-DAQ 2005). Data represent UDAQ estimates for rural areas within the Uinta Basin.

Operations Impacts

Criteria Pollutants

The predicted criteria pollutant concentrations from operations after all wells and processing facilities have been developed are compared to applicable NAAQS standards and PSD Class II increments for NO_2 and PM_{10}. Any comparisons with PSD increments are intended only to evaluate potential impacts, and do not represent a regulatory PSD increment consumption analysis. PSD increment consumption analyses are typically applied to large industrial sources during the permitting process, and are solely the responsibility of the State of Utah and the EPA.

Emissions from natural gas compressor engines, well pad separator heaters, and mobile sources (tailpipe and fugitive dust emissions generated from operations and maintenance vehicles) were evaluated. In order to characterize full-field emissions, well pad and access road criteria pollutant emissions were aggregated into a large area source covering the BPPA. The proposed compression facility was represented as a point source at a proposed location in Section 2, Township 12 South, Range 22 East. As illustrated in **Table 4.3-2**, criteria pollutant concentrations predicted for ongoing operations would remain below all applicable standards.

Table 4.3-2. Proposed Action Operations Impacts					
Pollutant	Averaging Period	Ambient Air Concentration ($\mu g/m^3$)[a]			
		Predicted	% of PSD Class II Increment	Project + Background [b]	% of NAAQS (Project + Background)
NO_2	Annual	5	22 %	10	10 %
PM_{10}	24-hour	20	66 %	48	32 %
$PM_{2.5}$	24-hour	2.5	NA	27.5	79 %
	Annual	0.8	NA	9.8	65 %
CO	1-hour	1,269	NA	2,380	6 %
	8-hour	348	NA	1,459	15 %

[a] μ/m^3 is micrograms of pollutant per cubic meter of air.
[b] with NO_2 annual background 5 $\mu g/m^3$
[b] with PM_{10} 24-hour background 28 $\mu g/m^3$
[b] with PM_{10} annual background 10 $\mu g/m^3$
[b] with CO 1-hour and 8-hour background 1,111 $\mu g/m^3$
Source for Background Data: (UDEQ-DAQ 2005). Data represent UDAQ estimates for rural areas within the Uinta Basin.

Hazardous Air Pollutants

HAP impacts resulting from ongoing operations were evaluated for the proposed compression facility surrounded by a grid of well pad locations. Central facility emissions would include formaldehyde from the natural gas compressor engines, and BTEX and n-hexane from the dehydrator still-vent and condensate tanks. The well pad condensate storage tanks and dehydrators would also emit small quantities of BTEX and n-hexane. The well pads were assumed to have a maximum of four wells per pad with associated equipment.

There are no applicable State or Federal ambient air quality standards for evaluating HAP impacts. Therefore, HAP exposures were assessed by comparing predicted concentrations to the HAP specific thresholds described in **Section 3.3. Table 4.3-3** demonstrates that HAP impacts would be well below the Federal health thresholds.

Table 4.3-3. Proposed Action Proposed Action Non-Carcinogenic REL and RfC Impacts

HAP	Ambient Air Concentration (µg/m^3)[a]					
	One-Hour Maximum			Annual Average		
	REL	Predicted	% of REL	RfC[d]	Predicted	% of RfC
Benzene	1,300 [b]	120	9 %	30	1	3 %
Toluene	37,000 [b]	180	<1 %	400	2	<1 %
Ethylbenzene	350,000 [c]	20	<1 %	1,000	0.4	<1 %
Xylenes	22,000 [b]	100	<1 %	100	0.9	<1 %
n-Hexane	390,000 [c]	44	<1 %	200	0.7	<1 %
Formaldehyde	94 [b]	44	47 %	9.8	0.4	4 %

[a] µ/m^3 is micrograms of pollutant per cubic meter of air
[b] EPA Air Toxics Database, Table 2 (EPA 2002)
[c] Immediately Dangerous to Life or Health (IDLH)/10, EPA Air Toxics Database, Table 2 (EPA 2002) since no available REL
[d] EPA Air Toxics Database, Table 1 (EPA 2002)

Since benzene and formaldehyde are carcinogenic, annual average predicted concentrations were applied to assess a long-term cancer risk (based on 70-year exposure). Cancer risk was estimated for two exposure scenarios: 1) a maximally-exposed individual (MEI) corresponding to an individual that could be exposed continuously (24 hours per day, 7 days per week) for the entire life of the project (assumed as 25 years); and 2) given the remoteness of the area and absence of nearby residences, a most likely exposure (MLE) corresponding to an occupational exposure of 40 hours per week, 50 weeks per year, for 25 years. Exposure adjustment factors of 0.357 for the MEI (25/70) and 0.082 for the MLE [40*50/8760*(25/70)] were applied to the estimated cancer risk to account for the actual time that an individual could be exposed during a 70-year lifetime.

Table 4.3-4 presents the unit risk factor and the exposure adjustment factor for both the MLE and MEI exposure scenarios for benzene and formaldehyde. The unit risk factor is a slope factor that when multiplied by the ambient air concentration provides an estimate of the probability of one additional person contracting cancer based on continuous exposure over a 70-year lifetime. A range of unit risk factors is available for benzene.

Modeled HAP cancer risks for the Proposed Action are summarized below. Since HAP impacts for this analysis are assessed against incremental (rather than total) exposure, background HAP concentrations are not relevant. The maximum impact was observed near the facility boundary, decreasing sharply with

distance. The significant cancer risk criterion of 1 x 10^{-6} is at the low end of the range of cancer risks typically considered as acceptable when evaluating the health effects of a particular action. The range of acceptable cancer risks when evaluating the health effects of an action varies from one in a million to one in 10,000 (EPA 1999).

Table 4.3-4. Proposed Action Carcinogenic HAP Risk

HAP	Exposure Scenario	Unit Risk Factor ($1/\mu g/m^3$) [a]	Exposure Adjustment Factor	Predicted Annual Impact ($\mu g/m^3$)	Cancer Risk
Benzene	MEI	2.2 x 10^{-6}	0.357	1.0	< 1 in a million
		7.8 x 10^{-6}	0.357	1.0	3 in a million
Formaldehyde	MEI	1.3 x 10^{-5}	0.357	0.4	2 in a million
Benzene	MLE	2.2 x 10^{-6}	0.082	1.0	< 1 in a million
		7.8 x 10^{-6}	0.082	1.0	< 1 in a million
Formaldehyde	MLE	1.3 x 10^{-5}	0.082	0.4	< 1 in a million

[a] Source: (EPA 2003b). A range of unit risk factors is available for benzene.

Estimated project emissions of HAPs would be well below the levels that would create either acute, chronic, or carcinogenic health risks for individuals exposed to those compounds. Therefore, air quality impacts related to emissions of HAPs as a result of the Proposed Action would be minor.

In summary, while an emissions increase of both criteria and hazardous air pollutants is expected as a result of the Proposed Action activities, these emissions are not predicted to result in a violation of an ambient air quality standard or hazardous pollutant threshold. Accordingly, air quality impacts that would occur as a result of the Proposed Action during both the short-term development phase and long-term operations phase are likely to be minor.

4.3.2 ALTERNATIVE B – NO ACTION

Under the No Action Alternative, drilling would not be permitted on Federal leases. However, drilling and production would continue to occur on State of Utah and private leases. The No Action Alternative provides for 53 well pads and a total of 112 wells, developed over a 10-year period. In addition, a compressor station with 1,500 horsepower of natural-gas fired compression, and associated dehydration and storage tank capacity is proposed.

Although annual emissions on a project-wide basis would be substantially less than under the Proposed Action, short-term, localized ambient air quality concentrations predicted for well development (e.g., 24-hour maximum concentrations) would be equivalent to those predicted for the Proposed Action assuming that up to two adjacent locations could be constructed, drilled, or completed simultaneously. Similarly, NO_2, CO, and formaldehyde concentrations would be equivalent to those predicted under the Proposed Action since maximum impacts for these pollutants are largely a result of compressor engine operation which is planned for all alternatives. Localized dehydrator BTEX concentrations would also be equivalent to those predicted for the Proposed Action (maximum impacts observed near well pad and facility property lines) but would be more limited in scope due to the reduced number of proposed wells and pads. Predicted operation-related PM_{10} concentrations would be approximately 25 percent of the

Proposed Action mainly as a result of the reduction in vehicle-generated fugitive dust. Air quality impacts under the No Action Alternative would likely be minor.

4.3.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Under Alternative C, limited surface disturbance would be allowed within the Lower Bitter Creek 100-year floodplain and in the northern portion of the BPBA near the active sage-grouse lek. Minimizing surface disturbance within the Lower Bitter Creek floodplain would result in 272 proposed well pads and up to 664 proposed wells.

Annual emissions on a project-wide basis would be only slightly less than under the Proposed Action. Short-term, localized ambient air quality concentrations predicted during well development (e.g., 24-hour maximum concentrations) would be equivalent to those predicted for the Proposed Action assuming that up to two adjacent locations could be constructed, drilled, or completed simultaneously. Similarly, NO_2, CO, and formaldehyde concentrations would be equivalent to those predicted under the Proposed Action since maximum impacts for these pollutants are largely a result of compressor engine operation which is planned for all alternatives. Localized dehydrator BTEX concentrations would also be equivalent to those predicted for the Proposed Action (maximum impacts observed near well pad and facility property lines) but would be more limited in scope due to the reduced number of proposed wells and pads. Predicted operation-related PM_{10} concentrations would be approximately 85 percent of the Proposed Action concentrations mainly as a result of the reduction in vehicle-generated fugitive dust. Air quality impacts under Alternative C would likely be minor.

4.3.4 MITIGATION MEASURES

No additional mitigation measures beyond those discussed in **Chapter 2** are proposed.

4.4 PALEONTOLOGY

4.4.1 ALTERNATIVE A – PROPOSED ACTION

Potential impacts to paleontological resources include the loss of scientifically important fossils due to surface-disturbing activities such as well pad, access road, and pipeline excavation and grading. The loss of fossils could result from crushing by construction equipment as well as increased theft and vandalism of exposed fossils. Alternatively, construction of the project facilities may uncover scientifically important fossils, which could be considered a positive (beneficial) impact. A total of about 1,620 acres would be disturbed during the construction of the Proposed Action facilities.

The entire BPPA has a fairly high potential for producing significant fossil material. Therefore, onsite paleontological surveys would be conducted in the immediate area of all proposed surface disturbing activity (roads, pipelines, well sites, staging areas, etc.) as directed by the SMA. Surveys would not be necessary where Quaternary alluvium is obviously thick enough to cover the “Class 4a” Uinta Formation. Surveys would identify and classify any specific paleontological resources to be impacted by development activity and mitigation would then be proposed based on that information.

4.4.2 ALTERNATIVE B – NO ACTION

Under the No Action Alternative, a total of about 319 acres would be disturbed during the construction period. Potential impacts to paleontological resources would be reduced compared to the Proposed

Action since substantially less surface disturbance would occur. Conversely, the potential for discovering new localities would also be decreased because not as much acreage would be surveyed.

4.4.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Potential impacts to paleontological resources under Alternative C would be similar, although lower in magnitude, to those described under the Proposed Action. A total of about 1,515 acres would be disturbed during the construction of the facilities, or about 94 percent of that under the Proposed Action.

4.4.4 MITIGATION

No additional mitigation measures are proposed for protection of paleontological resources.

4.5 CULTURAL RESOURCES

Ground-disturbing activities, such as well pad and road construction, and secondary surface activities, such as vehicular and pedestrian traffic, can directly and irreversibly damage or destroy sensitive cultural resources. Many of the known archaeological sites – both prehistoric and historic – in the Uinta Basin are shallow and therefore vulnerable to the direct impacts of vegetation clearing, ROW blading, and excavation of soils.

Indirect impacts could include damage or destruction of cultural resources as a result of increased visitation of otherwise remote areas and as a result of improved public access to these areas provided by Project Area access roads.

4.5.1 ALTERNATIVE A – PROPOSED ACTION

The Proposed Action would include potential initial disturbance of approximately 1,620 acres, or about 5 percent of the land surface in the Project Area. Many of the existing cultural resources surveys within the Project Area were conducted in advance of, or in preparation for oil and gas development. Specific potential impacts to cultural resources related to the Proposed Action would not be known until surveys are completed for the 292 well pad locations and ancillary facilities and, if necessary, cultural resource properties are evaluated for eligibility to the NRHP. Archival record searches identified 33 previously documented archaeological sites within the Project Area.

While the potential for direct impacts to eligible cultural resources is likely to increase with increased well density and associated facilities, those impacts can be mitigated by the preparation and execution of applicant committed environmental protection measures (**Section 2.2.1**).

The Proposed Action would result in increased human presence in the Project Area during well field development and operation. In addition, proposed well field roads would provide increased motorized access to areas that may contain cultural resources. Vandalism of cultural resources could occur as an indirect effect of the Proposed Action.

4.5.2 ALTERNATIVE B – NO ACTION

Under the No Action Alternative, the potential for impacts to cultural resources would be similar in nature to those described for the Proposed Action; however, they would occur on a much smaller scale, as only 53 well pads would be constructed for an estimated initial disturbance of 319 acres.

4.5.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Under Alternative C, 272 well pads would be developed within the Project Area (approximately 1,515 acres of initial disturbance). Impacts to cultural resources would be similar in nature and of slightly lower magnitude to those described under the Proposed Action.

4.5.4 MITIGATION MEASURES

Coordination between the BLM VFO and the Utah SHPO would provide mitigation as needed for any eligible sites which may be present within the area of potential effect and could include excavation, rerouting of project facilities, and other measures as appropriate.

4.6 SOIL RESOURCES

4.6.1 ALTERNATIVE A - PROPOSED ACTION

4.6.1.1 Soil Resources

Potential impacts to soils from the Proposed Action include the removal of vegetation, mixing of soil horizons, soil compaction, increased susceptibility of the soils to wind and water erosion, contamination of soils with petroleum products, and loss of topsoil productivity.

A total of about 1,620 acres of soils would be disturbed during the construction of well pads, access roads, and pipelines during the initial disturbance. This represents about 4.7 percent of the total land surface of 34,471 acres in the Project Area.

Erosion and Sedimentation

The primary effect of surface disturbance on soil resources is increased erosion and the resulting potential increase in sediment yield to nearby ephemeral drainages and Bitter Creek. Excavation of proposed well pads would result in increased erosion of Project Area soils during initial disturbance. Additional erosion may be expected from construction of access roads, pipeline ROWs, and the compressor station.

The current average erosion rate for soils within the Uinta Basin is reported to be about 1.45 tons per acre per year (BLM 1984). The majority of the sediment included in this average rate is thought to be derived from erosion of the badlands areas that occur to the northeast of the Project Area (BLM 1984). Therefore, erosion rates for individual soil types within the Project Area are likely lower than this estimate.

Two studies conducted on sediment yield from disturbed surfaces provide some insight into the amount of increased erosion that could be expected from construction of well pads, roads, and other project facilities in the Project Area. Lusby and Toy (1976) reported that yields from reclaimed surface mines were initially 300 percent to 600 percent higher than from undisturbed surfaces. Frickel et al. (1975) found that yields increased to about 2.9 tons per acre per year (about a 100 percent increase) in the Piceance Basin of Colorado after construction of oil shale project facilities. Using these studies as examples, it is assumed that average erosion rates for soils in the Project Area would triple from about 1.45 tons per acre per year to about 4.35 tons per acre per year during the initial disturbance. This increased erosion rate would generate an additional 4,698 tons of erosion annually during construction of the project facilities. This represents a theoretical increase of about 9.0 percent for the total erosion rate for the Project Area.

An unquantifiable amount of sediment is expected to reach the system of ephemeral drainages and, eventually, Bitter Creek and the White River, due to the development of 65 miles of new roads. The actual amount of sediment delivered to the waterways would be dependant upon how often roads cross drainages, and the sediment delivery efficiency of the drainage network.

Soil Compaction

Rangeland health standards were adopted by the Utah BLM State Office to assist in the planning process for grazing, recreation, and other activities on BLM lands. These standards are applicable to the construction of new roads and well pads on BLM lands. Rangeland Health Standard 1 states that "upland soils should exhibit permeability and infiltration rates that sustain or improve site productivity, considering the soil type, climate, and landform." The Proposed Action would have a minor impact on the attainment of this standard due to compaction and blending of soils in some locations.

Compaction due to construction activities at the well pads and along access roads would reduce aeration, permeability, and water-holding capacity of the soils. An increase in surface runoff could be expected, potentially causing increased sheet, rill, and gully erosion. These impacts would be localized in nature and could potentially impact approximately 5 percent of the Project Area. In addition to the lands directly disturbed by construction activities, the area impacted could include lands adjacent to the proposed facilities if excessive erosion or gullying occurs in these areas. The segregation and reapplication of surface soils would cause the mixing of shallow soil horizons, resulting in a blending of soil characteristics and types. This blending would modify physical characteristics of the soils including structure, texture, and rock content, which could lead to reduced permeability and increased runoff from these areas.

Soil Contamination

Contamination of surface and subsurface soils near gas facilities is known to occur in oil and gas fields. Sources of potential contamination include leaks or spills of natural gas condensate liquids from wellheads, conveyance pipelines, produced water sumps, and condensate storage tanks. Petroleum released to surface soils infiltrates the soil and can migrate vertically until the water table is encountered. Leaks or spills of saline water, hydrofracturing chemicals, fuels, and lubricants could also result in soil contamination. Depending on the size and type of spill, the effect on soils would primarily consist of the potential loss of soil productivity. Thus, the potential for impacts to soils from spills is considered to be minor. Implementation of the SPCC Plan would minimize the risk of spills by providing safeguards against spills and detailing reporting and cleanup measures to be taken in the event of a spill.

4.6.2 ALTERNATIVE B - NO ACTION

Under the No Action Alternative, new wells would not be allowed on Federal lands. However, wells would still be drilled on private, State of Utah, and Tribal lands within the Project Area. A total of 53 well pads could be constructed under the No Action Alternative, as compared to 292 well pads under the Proposed Action. The initial surface disturbance would be about 319 acres, or about one-fifth of the 1,620 acres disturbed under the Proposed Action. Accordingly, the amount of potential impacts to soil resources would be about one-fifth of that for the Proposed Action. During the construction of these facilities, the additional erosion would be about 980 tons per year. Impacts associated with soil compaction and contamination would be similar in nature, but smaller in magnitude, to those described for the Proposed Action.

4.6.3 ALTERNATIVE C - LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Under Alternative C, initial surface disturbance would be about 1,515 acres as compared to 1,620 acres under the Proposed Action. Accordingly, the potential impact to soil resources would be similar in nature but smaller in magnitude to that of the Proposed Action. During the construction of these facilities, the additional erosion would be about 4,394 tons per year, or about 94 percent of that for the Proposed Action.

The Proposed Action includes measures to minimize the amount of additional sedimentation to Project Area drainages. Well pads would generally be located at least 100 feet from both perennial streams and ephemeral drainages. The exact locations of the proposed well pads and routes of new access roads would be determined on a site-specific basis in consultation with the SMA and would be chosen to minimize potential environmental impacts, including excessive erosion and potential sedimentation of ephemeral drainages and livestock ponds. Where applicable, construction activities would proceed in accordance with the design standards presented in the "Gold Book", Surface Operating Standards for Oil and Gas Extraction and Development (BLM and USFS 2007). Unlike surface and buried pipelines, active roadways are not reclaimed in the interim, thus sediment yield from roads can continue at rates two to three times above background rates into the indefinite future. The actual amount of sediment delivered to the waterways would be dependant upon how often roads cross drainages, and the sediment delivery efficiency of the drainage network.

To reduce the potential for hydrocarbon contamination of soils, pipelines and associated collection piping would be designed to minimize the potential for spills and leaks. Storage tanks would be surrounded by berms capable of holding at least 110 percent of the largest single tank volume. Implementation of the SPCC Plan would minimize the risk of spills by providing safeguards against spills and detailing reporting and cleanup measures to be taken in the event of a spill.

4.6.4 MITIGATION MEASURES

The following additional mitigation measures would be implemented to help prevent erosion and subsequent sedimentation:

- Surface-disturbing activities should be avoided on areas of high erosion potential (40 percent or greater slopes).
- Construction should not occur during periods of saturated soil conditions when surface ruts greater than 4 inches would occur along straight travel routes.
- A Reclamation Plan for the Field Development should be developed prior to the commencement of construction activities.

4.7 WATER RESOURCES

4.7.1 ALTERNATIVE A - PROPOSED ACTION

4.7.1.1 Surface Water

The potential impacts to surface water are:

- Increased sedimentation and turbidity of surface water via runoff as a result of surface disturbance and increased erosion into surface waters;
- Depletion of water flow in the White River due to project-related water consumption; and
- Effects on water quality – i.e., potential contamination of surface water resources with drilling fluids, petroleum, or other chemicals used for natural gas drilling and production activities.

The potential for impacts would be greatest shortly after the start of construction activities and would decrease in time due to natural stabilization, reclamation, and revegetation efforts. The magnitude of these potential impacts to surface water resources depends on several factors, including the proximity of the disturbance to the water influence zone (WIZ) of surface water drainages or ponds, slope aspect and gradient, soil type, the duration and timing of the construction activity, and the success or failure of reclamation and mitigation measures. The WIZ is defined as the buffer zone that includes the floodplain, riparian vegetation, inner gorge, unstable areas, or highly erodible soils located adjacent to a stream or other water body. Each of the potential impacts is discussed in detail below.

Increased Sedimentation and Turbidity

Increased erosion and subsequent increased sedimentation of perennial streams and ephemeral drainages within the Project Area is possible, especially during the construction of project facilities. The increased erosion could also potentially lead to an increase in turbidity in Sand Wash, Bitter Creek, and other drainages. Both of these effects could have negative impacts on aquatic habitat within affected drainages.

Soil loss calculations indicate that an estimated 4,698 tons per year of additional erosion could be expected to occur as a result of the Proposed Action. This erosion estimate is subject to considerable uncertainty. Over time, short-duration precipitation events and snowmelt could cause soil lost from the proposed facilities in the Project Area to reach the drainages of adjacent ephemeral watersheds. This sediment could then eventually be transported down the ephemeral drainages to Sand Wash and Bitter Creek, and on to the Green River. In sufficient amounts, the additional sediment from construction activities and operational facilities could clog stream channels, cause accelerated siltation of livestock ponds, degrade aquatic habitat by covering stream substrates with fine sediment, increase the turbidity within the streams during the short-term, and act as a carrier for other pollutants (e.g., trace metals, pesticides, plant nutrients, etc.).

With the proper application and maintenance of erosion control measures, the actual amount of sediment that could potentially be transported to the Green River would be much less than the additional gross erosion estimated in **Section 4.6.1.1**. The amount of additional sediment that could potentially reach the drainages in the Project Area depends on natural factors and the effectiveness of the erosion control measures employed. Natural factors which attenuate the transport of sediment into creeks include: water available for overland flow; the texture of the eroded material; the amount and kind of ground cover; the slope shape, gradient, and length of the creek; and surface roughness (Barfield et al. 1981).

The erosion control measures employed would be of two types: non-structural controls and structural controls. Non-structural controls include proper clearing, grading, and construction practices, including surface roughening, crowning and ditching of roadways. Structural controls would be used along the proposed access roads, at drilling locations, and at other project facilities to minimize the amount of sediment that reaches any ephemeral drainage in the Project Area, where needed. The structural controls used would be specified during the APD process for each project facility.

Studies concerning the effectiveness of the structural erosion controls for oil and gas sites have not been conducted. However, several studies conducted in urban settings provide some insight into the potential effectiveness of the structural erosion controls that would likely be employed for erosion control in the Project Area. The EPA (1999) estimated that the theoretical total suspended solids (TSS) removal efficiency for retention basins, infiltration basins, and vegetated filter strips are all in the range of 50 to 80 percent. Actual performance for these structural erosion controls was measured at urban sites and was reported to be 70 percent for retention basins, 89 percent for infiltration basins, and 81 percent for vegetated filter strips. In another study, EPA (2004) reported ranges of TSS removal of 58 to 78 percent for retention basins, 75 percent for infiltration basins, and 54 to 84 percent for vegetated filter strips. Using these studies as examples, it is assumed that the structural erosion controls employed would be about 70 percent effective in removing TSS from surface water runoff from project facilities. Therefore, for the purposes of estimating the amount of increased sediment delivery, it is assumed that 30 percent of the increased erosion calculated could be expected to eventually be delivered to Sand Wash, Bitter Creek, and the Green River.

If the natural factors that affect sediment delivery are ignored, the estimated additional sediment delivery from the Proposed Action would be about 1,409 tons per year. Annual sediment loading in the Green River at Ouray, Utah is about 6,789,000 tons. The highest sediment loading occurs during the months of May and June from snowmelt runoff. If it is assumed that all sediment from the construction of the project facilities would eventually be transported to the Green River, the increased sediment loading to the Green River would be about 0.021 percent.

Stream Flow Regimes

As previously discussed, the 12-year development use would be approximately 480 acre-feet for an average of 40 acre-feet per year. Water needed for the drilling and completion of each well, as well as for dust suppression, would be obtained from the White River under an existing permit (#49-2279 [T77865]). The anticipated water use is not expected to alter stream flow regimes.

Water Quality

Sources of potential surface water contamination include leaks from wellheads, gathering pipelines, produced water and condensate storage tanks, and tanker trucks, and leaching of contaminants from impacted soils near these facilities. In addition, accidental spills of hydrocarbon products, including fuels and petroleum products produced by the wells, would have the potential to contaminate surface waters. The impacts from a potential spill would be localized and have little chance of migrating to the Green River. Since surface disturbance within close proximity to streams have the greatest potential for impacting water resources, rapid and successful reclamation/re-vegetation of temporarily disturbed areas would be particularly important in minimizing water quality impacts.

Hydrofracturing for the proposed wells would be conducted as part of the Proposed Action. Hydrofracturing is commonly used to enhance the recovery of natural gas from relatively impermeable “tight” sandstones, and involves the injection of water or other fluids, which may contain some petroleum constituents, and sand or another “proppant” into the formation. Hydrofracturing would occur at depths

of at least 8,000 feet or more below the surface. Therefore, the potential for impacts to surface water resources from the proposed hydrofracturing is considered to be negligible.

4.7.1.2 Floodplains

Construction activities near and within floodplains can result in impacts on resources including increased sediment deposition to watercourses, removal of sensitive riparian habitat, water quality degradation, and loss and/or modification of wildlife habitat both within the Project Area and farther downstream.

Road construction within the floodplain potentially increases the risk of erosion and sediment production. Increased sediment could impact water quality and wildlife resources. Impacts to wildlife resources are discussed in detail in **Section 4.9**.

Under the Proposed Action, 20 well pads, approximately 2.1 miles of new collocated roads and pipelines, and approximately 7.25 miles of pipelines would be constructed on the 100-year floodplains of Sand Wash, Bitter Creek, and Buck Camp for a total of approximately 102 acres of surface disturbance. Of the total, three of the well pads, approximately 0.5 mile of collocated roads and pipelines, and 0.4 mile of pipelines (or 17 acres of surface disturbance) would be located on State or private surface, with the remainder located on BLM-administered lands.

4.7.1.3 Groundwater

Groundwater exists in shallow unconsolidated alluvium along ephemeral washes and in deeper bedrock formations beneath the Project Area. Spills of fuels or produced fluids from well pads, pipelines, and compressor stations have the potential to contaminate groundwater resources, especially shallow alluvial groundwater. Spills from facilities located adjacent to ephemeral washes would have the greatest potential to contaminate groundwater. The impacts from such a spill would be localized and would not likely migrate to the Green River. With the application of standard industry operating procedures (casing and cementing of shallow groundwater zones), the potential for chemicals contaminating shallow groundwater aquifers is considered to be low.

No produced water would be discharged into surface water drainages or allowed to flow onto the ground surface. There is a slight chance that produced water could be spilled during the loading operations. However, given the ACEPMs that would be employed to control storm water runoff at each drilling location, there is little chance that produced water would enter and contaminate shallow alluvial aquifers. Accordingly, the potential for contamination of groundwater resources by produced water is considered to be negligible.

4.7.2 ALTERNATIVE B - NO ACTION

4.7.2.1 Surface Water

Under the No Action Alternative, new wells would not be allowed on Federal lands. A total of 53 well pads and up to 112 wells could be constructed under the No Action Alternative on private and State of Utah lands, as compared to 292 well pads and 664 wells under the Proposed Action. Accordingly, the amount of potential impacts to water resources would be about one-fifth of that for the Proposed Action.

Increased Sedimentation and Turbidity

Increased erosion and subsequent increased sedimentation of perennial streams and ephemeral drainages within the Project Area is possible, especially during the construction of the project facilities. The

increased erosion could also potentially lead to an increase in turbidity in Sand Wash, Bitter Creek, and other drainages. Both of these effects could have negative impacts on aquatic habitat within affected drainages.

Soil loss calculations indicate that an estimated 980 tons per year of additional erosion could be expected to occur under the No Action Alternative. The actual amount of additional sediment that would reach the drainages in the Project Area depends on natural factors and the effectiveness of the structural erosion controls employed, as described above for the Proposed Action. If the natural factors that affect sediment delivery are ignored, the estimated additional sediment delivery from the No Action Alternative is about 294 tons per year, or about 21 percent of that for the Proposed Action.

Stream Flow Regimes

Wells would be drilled at a variable rate per year for a maximum of ten years. Typically, water used for drilling and completion would be approximately 0.75 acre-feet (244,390 gallons) per well. Annual water usage would vary depending upon the total number of wells drilled per year. Assuming 11 wells per year are drilled, the average annual water usage would be approximately 8.25 acre feet per year. Water for development would be drawn from an existing water right on the White River. There would be no diversions from or alterations of flow regimes of Sand Wash or Bitter Creek.

Water Quality

Leaks from wellheads, gathering pipelines, storage tanks, and tanker trucks, leaching of contaminants from impacted soils near these facilities, and accidental spills of hydrocarbon products would have the potential to contaminate surface waters. The impacts from such a spill would be localized and have little chance of migrating to the Green River. Rapid and successful reclamation/re-vegetation of temporarily disturbed areas, and implementation of the additional mitigation measures to reduce erosion, would be particularly important in minimizing water quality impacts. Because of the reduced number of wells, the chance of a spill would be about 17 percent of that for the Proposed Action.

As described above for the Proposed Action, the potential for impacts to surface water resources from the proposed hydrofracturing is considered to be negligible.

4.7.2.2 Floodplains

Under the No Action Alternative, new wells would not be allowed on Federal lands. However, wells would still be drilled on private and State of Utah lands within the Project Area.

Under Alternative B, one well pad, approximately 0.5 mile of new collocated roads and pipelines, and 3.6 miles of pipelines would be constructed on 100-year floodplains, mostly on private or State lands. In order to access these parcels, as allowed under Federal law, approximately 0.1 mile of new road and collocated pipeline and approximately 3.2 miles of pipelines would be constructed on BLM lands. A total of approximately 18 acres of surface disturbance would initially result from construction on the floodplains, with 14 acres on State or private surface and 4 acres on BLM lands.

4.7.2.3 Groundwater

For the No Action Alternative, potential impacts to groundwater would be similar in nature to those described under the Proposed Action. A total of up to 112 wells could be constructed under the No Action Alternative, as compared to 664 wells under the Proposed Action. Accordingly, the potential for

contamination of groundwater from the No Action Alternative is about 21 percent of that for the Proposed Action.

4.7.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

4.7.3.1 Surface Water

Potential impacts to surface water under Alternative C are similar to those for the Proposed Action. Soil loss calculations indicate that an estimated 4,686 tons per year of additional erosion could be expected to occur as a result of Alternative C. If the natural factors that affect sediment delivery are ignored, the estimated additional sediment delivery from Alternative C would be about 1,318 tons per year, or about 94 percent of that under the Proposed Action. Annual sediment loading in the Green River at Ouray, Utah is about 6,789,000 tons. If it is assumed that all sediment from the construction of the project facilities would eventually be transported to the Green River, the increased sediment loading to the Green River would be about 0.019 percent.

Stream Flow Regimes

As described in Chapter 2, water use during development would be approximately 480 acre-feet for an average of 40 acre-feet/year. Water needed for the drilling and completion of each well, as well as for dust suppression, would be obtained from the White River under an existing permit (#49-2279 [T77865]). The anticipated water use is not expected to alter stream flow regimes.

Water Quality

Sources of potential surface water contamination include leaks from wellheads, gathering pipelines, produced water and condensate storage tanks, and tanker trucks, and leaching of contaminants from impacted soils near these facilities. In addition, accidental spills of hydrocarbon products, including fuels and petroleum products produced by the wells, would have the potential to contaminate surface waters. The impacts from a potential spill would be localized and have little chance of migrating to the Green River. Since surface disturbance within close proximity to streams have the greatest potential for impacting water resources, rapid and successful reclamation/revegetation of temporarily disturbed areas would be particularly important in minimizing water quality impacts.

As described for the Proposed Action, the potential for impacts to surface water resources from the proposed hydrofracturing would be considered to be negligible.

4.7.3.2 Floodplains

Under Alternative C, four well pads, approximately 1.8 miles of new collocated roads and pipelines, and approximately 7.2 miles of pipelines would be constructed on 100-year floodplains. A total of approximately 67 acres of surface disturbance would initially result from construction on the floodplains, with 12 acres on State or private surface and 55 acres on BLM lands.

Standard industry practices and safety measures associated with the installation of roads, pipelines, and well pad facilities, and the containment of storage tanks in bermed areas would be implemented to minimize the potential for accidental spills or introduction of contaminants to Project Area drainages. To minimize the potential for hydrocarbon contamination of surface water, pipelines and associated collection piping would be designed to minimize the potential for spills and leaks. Storage tanks would be surrounded by berms capable of holding at least 110 percent of the volume of the largest tank within

the berm. All produced water would be removed from the BPPA and disposed of at an off-site permitted facility. In addition, the reserve pit at each drilling location would be lined with impervious liner, as described in Chapter 2. These measures would lessen the potential for adverse impacts to surface water resources.

For well pads constructed on floodplains, the applicant has committed to using closed-loop drilling, which would eliminate the need for a reserve pit and reduce the surface footprint of the well pad. The use of closed-loop drilling would greatly lessen the potential for contamination of shallow groundwater. In addition, berms would be constructed around the well pad in such a manner that any spills that might occur on the well pad would not migrate to adjacent surface water drainages. Seed mixtures utilized for interim reclamation on well pads and along pipeline corridors would be specific to floodplains and the riparian vegetation communities present. These measures would reduce the potential for adverse impacts to surface water.

4.7.3.3 Groundwater

The potential for contamination of groundwater from Alternative C is expected to be similar to that for the Proposed Action. However, the application of the mitigation measures discussed in Chapter 2 for protection of floodplains, the potential for contamination of shallow groundwater would be less than under the Proposed Action.

4.7.4 MITIGATION MEASURES

No additional mitigation measures are recommended.

4.8 VEGETATION

Issues raised involving vegetation resources with the BPPA include potential impacts to special status plant species and their habitats, impacts to wetlands/riparian zones, as well as impacts to the vegetation communities associated with the Project Area. These impacts are assessed below.

Under all alternatives, the introduction and/or spread of noxious weeds in the Project Area would occur. However, the applicant's commitment to annual monitoring and the control of weeds (as described in **Section 2.2.1.4**) would minimize the spread of weeds. As stated in **Chapter 3**, the badlands/rock outcrop, black sagebrush, and woodlands in shallow soils have a low likelihood for successful reclamation following disturbance. Thus, about 26 to 47 percent of the Project Area would have little potential for successful reclamation using standard practices, depending on the alternative chosen.

4.8.1 ALTERNATIVE A – PROPOSED ACTION

4.8.1.1 General Vegetation, Including Invasive and Noxious Weed Species

Existing vegetation would be removed from a total of about 1,620 acres (5 percent) of the Project Area. The Proposed Action would involve a progressive development. The acres of disturbance calculated and assessed in this document relate to the total acres; however, at any one time, the number of disturbed acres would be less than that set out below. These impacts would affect communities' composition and productivity. **Table 4.8-1** summarizes estimated surface disturbance impacts to vegetation communities from the Proposed Action.

Table 4.8-1 Estimated Surface Disturbance Impacts to Vegetation Communities from the Proposed Action

Vegetation Community	Disturbance (acres) in Project Area	Percent of Project Area	Likelihood for Successful Reclamation[1]
Badlands/Rock Outcrop	24	<1	None to Very Low
Black Sagebrush	231	<1	Low
Greasewood	105	<1	Low - Moderate
Wyoming Big Sagebrush	813	2	Moderate
Pinyon-Juniper Woodlands	447	1	Low - Moderate
Total	**1,620**	**<5**	

[1] The likelihood for successful reclamation is directly dependent on site-specific soil characteristics (including depth of topsoil, soil texture, and parent material) and effective precipitation levels received following revegetation.

Vegetation removal and soil handling associated with the Proposed Action would have both direct and indirect impacts on vegetation resources. Direct effects would include removal of vegetation, modification of species composition and structure, and fragmentation of vegetation habitats. Indirect impacts may include increased potential for weed invasion, effects of fugitive dust on plants, increased exposure of soils to accelerated erosion, and degradation and loss of topsoil and soil microorganisms.

Specific actions set out under the Proposed Action, including ACEPMs such as reclamation and monitoring of disturbed areas, control of soil erosion, minimizing vegetation disturbance, dust abatement measures, and control of noxious weeds, would reduce impacts to vegetation communities in the Project Area. The ability of each vegetation community to successfully recover to pre-disturbance production levels would depend on the disturbed site's specific characteristics. Assuming revegetation actions are successful, the anticipated impacts to vegetation resources would be reduced.

4.8.1.2 Wetlands and Riparian Zones

Indirect impacts to wetlands and riparian zones could result from increased sediment loading to these areas, a potential increase in noxious weeds, and a potential for spills and leaks from construction equipment. Use of erosion controls, as well as interim and final reclamation measures, would contribute to minimizing soil erosion and sediment loading. In addition, noxious weed control in disturbed areas would reduce indirect impacts to wetlands and riparian zones. Furthermore, impacts related to the increased potential for exposure to hazardous substances would be minimized by compliance with SPCC regulations.

4.8.1.3 Special Status Plant Species

As approximately 292 acres of habitat for the Graham's beardtongue occurs in the southern portion of the BPPA, surface-disturbing activities in these areas (i.e., to Evacuation Creek Member) could negatively affect occupied and suitable habitat for the Graham's beardtongue. Under the Proposed Action, site-specific field surveys, as described in the species-specific conservation measures (**Appendix E**), would be conducted in habitat for the Graham's beardtongue prior to any surface-disturbing activities. Implementation of actions described in the conservation measures would avoid occupied habitat, and minimize disturbance to suitable habitat. Surface-disturbing activities would not occur in occupied habitat, thus avoiding direct impacts to individual plants.

Increased roadway infrastructure and vehicle traffic in the Project Area could lead to indirect impacts to the Graham's beardtongue. These indirect impacts include loss or modification of potential or suitable habitat, an increase spread of invasive and noxious weed species, and an increase in fugitive dust. Weed

species may compete with individual special status plants, potentially resulting in loss of individuals and degradation of suitable special status plant habitat. Fugitive dust from areas cleared of vegetation such as roadways may affect photosynthesis, respiration, and transpiration, and allow for the penetration of phytotoxic gaseous pollutants (Farmer 1993). Specific actions set out under the Proposed Action that would reduce indirect impacts to special status plant species include: 1) treatment and control of noxious and invasive plant species, 2) use of existing roads when possible, 3) minimizing surface disturbance, 4) dust abatement, and 5) adherence to conservation measures (**Appendix E**).

Adherence to the above-mentioned measures would reduce impacts to the Graham's beardtongue such that the Proposed Action may affect, but would not likely lead towards Federal listing of the Graham's beardtongue.

4.8.2 ALTERNATIVE B – NO ACTION

4.8.2.1 General Vegetation, Including Invasive and Noxious Weed Species

Impacts to vegetation resources from implementation of Alternative B would be the lowest of all three alternatives. Impacts would be similar to those identified under the Proposed Action, but smaller in magnitude due to the reduced surface disturbance under Alternative B. Surface disturbance under Alternative B would be approximately 319 acres (a 79 percent reduction from the Proposed Action). **Table 4.8-2** provides a breakdown of surface disturbance by vegetation community from implementation of Alternative B.

Table 4.8-2. Estimated Surface Disturbance Impacts to Vegetation Communities from Alternative B

Vegetation Community	Disturbance (acres) in Project Area	Percent of Project Area	Likelihood for Successful Reclamation[1]
Badlands/Rock Outcrop	3	<1	None to Very Low
Black Sagebrush	45	<1	Low
Greasewood	27	<1	Low - Moderate
Wyoming Big Sagebrush	191	<1	Moderate
Pinyon-Juniper Woodlands	53	<1	Low - Moderate
Total	**319**	**<1**	

[1] The likelihood for successful reclamation is directly dependent on site-specific soil characteristics (including depth of topsoil, soil texture, and parent material) and effective precipitation levels received following revegetation.

4.8.2.2 Wetlands and Riparian Zones

Impacts to wetlands and riparian zones from implementation of Alternative B would be similar to those identified and assessed for the Proposed Action. Under Alternative B, a proposed pipeline would be collocated with an existing road along approximately one mile of wetlands and riparian zones in the northeast portion of the Project Area. As under the Proposed Action, specific actions set out under Alternative B would avoid direct impacts and reduce indirect impacts to wetlands and riparian zones located within or downstream from the BPPA.

4.8.2.3 Special Status Plant Species

Of the three alternatives, Alternative B would result in the least amount of surface disturbance. Thus, the scale and magnitude of potential impacts to the Graham's beardtongue would be correspondingly less throughout the BPPA. As under the Proposed Action, species-specific conservation measures for the

Graham's beardtongue would be adhered to and, therefore, impacts to the species would be avoided and reduced.

Adherence to all protection measures previously discussed under the Proposed Action (**Section 2.2.1**) would reduce impacts to the Graham's beardtongue such that Alternative B may affect, but would not likely lead towards Federal listing of the Graham's beardtongue.

4.8.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

4.8.3.1 General Vegetation, Including Invasive and Noxious Weed Species

Impacts to vegetation resources from implementation of Alternative C would be similar to those identified under the Proposed Action, but smaller in magnitude due to the lower surface disturbance under Alternative C. Surface disturbance under Alternative C would be approximately 1,515 acres (a 6 percent reduction from the Proposed Action). The minimized surface disturbance within 100-year floodplains would reduce the acreage of vegetation communities with low revegetation potential. **Table 4.8-3** provides a breakdown of surface disturbance by vegetation community from implementation of Alternative C.

Table 4.8-3. Estimated Surface Disturbance Impacts to Vegetation Communities from Alternative C

Vegetation Community	Disturbance (acres) in Project Area	Percent of Project Area	Likelihood for Successful Reclamation[1]
Badlands/Rock Outcrop	25	<1	None to Very Low
Black Sagebrush	246	<1	Low
Greasewood	81	<1	Low - Moderate
Wyoming Sagebrush	719	2	Moderate
Pinyon-Juniper Woodlands	444	1	Low - Moderate
Total	**1,515**	**4**	

[1] The likelihood for successful reclamation is directly dependent on site-specific soil characteristics (including depth of topsoil, soil texture, and parent material) and effective precipitation levels received following revegetation.

4.8.3.2 Wetlands and Riparian Zones

Impacts to wetlands and riparian zones from implementation of Alternative C would be similar to those identified and assessed for the Proposed Action. Under Alternative C, a proposed pipeline would be collocated with an existing road along approximately one mile of wetlands and riparian zones in the northeast portion of the Project Area. As under the Proposed Action, specific actions set out under Alternative C would avoid direct impacts and reduce indirect impacts to wetland and riparian zones located within or downstream from the BPPA.

4.8.3.3 Special Status Plant Species

Impacts to Graham's beardtongue under Alternative C would be slightly lower than those discussed under the Proposed Action as less overall surface disturbance would occur under Alternative C. Under Alternative C, a total of approximately 1,515 acres would be disturbed, which constitutes a 6 percent reduction of surface disturbance from the Proposed Action. However, as the majority of this decrease would occur in the northern portion of the BPPA, impacts to the Graham's beardtongue, whose potential habitat occurs mainly in the southern portion of the Project Area, would be essentially unchanged from

those estimated under the Proposed Action. As under the Proposed Action, species-specific conservation measures for the Graham's beardtongue would be adhered to, and, therefore, impacts to this species would be minimized.

Adherence to all protection measures previously discussed in the Proposed Action (**Section 2.2.1**) would reduce impacts to the Graham's beardtongue such that Alternative C may affect, but would not likely lead towards Federal listing of the Graham's beardtongue.

4.8.4 MITIGATION MEASURES

No additional mitigation measures beyond those described in Chapter 2 and **Appendix E** are recommended.

4.9 WILDLIFE AND FISHERIES

4.9.1 ALTERNATIVE A – PROPOSED ACTION

The principal wildlife impacts with the potential to occur under the Proposed Action include: (1) a direct loss, degradation, or fragmentation of wildlife habitats; (2) decreased use of certain habitats through displacement of some wildlife species resulting in potential inter- and intra-specific competition, and subsequent effects of deteriorated physical condition, and general distress; (3) a decrease in reproductive success and nutritional condition from increased energy expenditure due to physical responses to disturbance; (4) an increase in the potential for collisions between raptors, big game, or other wildlife and motor vehicles due to increased traffic; and (5) an increase in the potential for poaching or harassment of wildlife.

4.9.1.1 General Wildlife

The initial disturbance of approximately 1,620 acres of potential wildlife habitat associated with the construction of wells, access roads, pipelines, a compressor station, and related facilities and infrastructure would reduce habitat availability for a variety of common wildlife species. Habitat disturbance would be expected to have a minor to moderate impact on general wildlife species due to the following:

- Many of the species discussed (e.g., cottontails, jackrabbits, coyotes, skunks, and rodents) are habitat generalists, meaning they are not tightly restricted to specific habitat types; and
- Many wildlife populations within the BPPA have likely adapted to existing gas exploration and production activities.

Project implementation would directly and indirectly increase habitat loss and habitat fragmentation in the BPPA. Disturbances from drilling activities and increased traffic could displace wildlife from habitats in areas of human activity. Construction may result in displacement from affected habitats during the entire construction phase of a well, road, or pipeline (weeks); whereas production could result in displacement only during well visits (hours). When displaced, individuals could move into less suitable habitats or into habitats where inter-and intra-specific competition for resources may occur, resulting in subsequent adverse effects of deteriorated physical condition, decreased reproductive success, and general distress. A long-term drought has already reduced forage quality and quantity in the Uinta Basin, which may increase the aforementioned effects associated with displacement.

Other direct impacts to general wildlife species could include a potential for mortality caused by equipment or vehicles on construction sites, and an increase in the potential for collisions between wildlife and motor vehicles on roads in the BPPA.

The severity of direct and indirect impacts on general wildlife species under the Proposed Action would depend on:

- The availability of habitats within and outside the BPPA;
- The sensitivity of the species to human activity;
- Seasonal and daily timing of construction and development activities; and
- Site-specific topography and vegetation (e.g., visually-obscured construction sites may impact nearby wildlife less than construction sites in full view).

4.9.1.2 Big Game

Many of the impacts associated with the Proposed Action would be similar to all big game species utilizing habitats in the BPPA. These impacts could include:

- Decreased habitat values and reduced habitat use within and/or near disturbed areas due to direct habitat loss and fragmentation of habitat;
- Decreased habitat values and reduced habitat use due to increased road and well pad densities within the BPPA, and in particular within the northern portion of the BPPA;
- Decreased reproductive success and nutritional conditions from increased energy expenditure as a physical response to disturbance;
- Increased stress from intra- and inter-specific competition for resources due to increased animal densities in adjoining or unsuitable habitats;
- Increased potential for collisions between vehicles and big game; and
- Increased harassment and/or poaching of big game species.

Species-specific habitat losses for UDWR-designated big game ranges associated with the Proposed Action are listed below in **Table 4.9-1**.

Table 4.9-1. Alternative A: Approximate Surface Disturbances[1] to Big Game Ranges

Range	Pronghorn Antelope (Acres)	Mule Deer (Acres)	Elk (Acres)	Rocky Mountain Bighorn Sheep (Acres)
UDWR-designated crucial winter	-	255	-	-
UDWR-designated substantial winter	-	679	1,153	-
UDWR-designated year-long crucial	740	-	-	193
UDWR-designated year-long substantial	95	-	-	-

[1] Estimated surface disturbance is given in acres.

As multiple big game herds are currently below UDWR-designated population objectives, the above-mentioned impacts could potentially contribute to other factors already affecting big game populations in the BPPA. However, as surface disturbance associated with the Proposed Action would be localized and would be minimal in relation to the extent of similar habitats across the region, impacts associated with the Proposed Action would not likely alter current big game population levels within the BPPA. In addition, if implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions for operators and their contractors to comply with designated speed limits could minimize the potential for vehicle collisions with big game. Furthermore, adherence to VFO ROD and Approved RMP restrictions to restrict surface-disturbing activities in UDWR-designated crucial winter mule deer habitat could reduce or minimize disturbances to, or displacement of, big game herds during these periods.

4.9.1.3 Raptors

Implementation of the Proposed Action could affect nesting and breeding raptors that utilize the BPPA. Direct and indirect impacts to raptors may include temporary displacement from suitable habitats during the breeding season due to increased noise levels and visual disturbances on the landscape and a reduction in habitat for prey species due to direct habitat loss.

Surface-disturbing activities or areas with concentrated human activity in close proximity (e.g., ½-mile) of an active raptor nest could lead to temporary displacement from nesting sites, avoidance of affected areas, and deterrence from establishing other nesting sites. Displacement could lead to nest failure or nest abandonment, thereby affecting the breeding pair and their annual productivity. Steidl and Anthony (2000) suggest that the greatest energetic costs from disturbance occur in nestlings, potentially decreasing overall reproductive success. Displacement could also lead to increased use of adjacent habitats, which could lead to increased inter- and intra-specific competitions for resources. However, as increased noise levels and visual disturbances associated with construction and drilling activities would be localized and short-term as compared to the life of the project, displacement to adjacent habitats would likely be temporary in nature and would not likely alter the productivity of current raptor populations within the BPPA. In addition, although human activity has been shown to adversely impact breeding raptors, some evidence of raptor habituation to human-induced disturbances has also been documented (Anderson et al. 1989; Steidl and Anthony 2000; Rodriguez-Estrella et al. 1998). Under the Proposed Action, six well pads within the BPPA are proposed within ½-mile of documented red-tailed hawk nests and 19 well pads are proposed within ½-mile of documented unknown raptor nests.

Specific actions under the Proposed Action, including ACEPMs listed below, would reduce both direct and indirect impacts to raptors. Raptor management would be guided by "*Best Management Practices for Raptors and Their Associated Habitats in Utah*" (see Appendix A of the Vernal ROD and Approved RMP) (BLM 2008a). As such, prior to any surface-disturbing activities during the breeding season, a BLM-approved contractor would survey all areas within 1 mile of proposed surface disturbance for the presence of raptor nests. If occupied/active raptor nests are found, construction would not occur during the nesting season for that species within a species-specific buffer described in the "*Guidelines*" mentioned above. In addition, as specified in these "*Guidelines*", and as determined by the AO of the appropriate SMA, modifications of these spatial and seasonal buffers for BLM-authorized actions would be permitted, so long as protection of nesting raptors is ensured (BLM 2008a). Furthermore, successful reclamation, in conjunction with implementation of a weed control plan, could reestablish raptor and prey species habitat over time.

In addition, surface disturbances associated with the Proposed Action would result in the direct loss of approximately 1,620 acres of habitat for raptor prey species such as mammals, songbirds, and reptiles. Rodriguez-Estrella et al. (1998) identify loss or fragmentation of habitat of prey species as a contributor

to raptor population declines. The reduction in prey habitat in the BPPA would be compounded by prey base losses that are already occurring in the Uinta Basin due to the ongoing drought. Under the Proposed Action, reclamation efforts (outlined in **Section 2.1.3** and described as ACEPMs in **Sections 2.2.1.5** and **2.2.1.9**) could somewhat restore prey habitat losses for raptor species over time. However, as the Proposed Action does not include provisions for notification of UDWR to remove carrion from BPPA roadways, shoulders, and ROWs, the potential for vehicle collisions with carrion-feeding raptors would increase in the BPPA as a result increased traffic levels. If implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions for operators and their contractors to comply with designated speed limits and contact the UDWR to remove carrion from roadways could minimize the potential for vehicle collisions with carrion-feeding raptors.

4.9.1.4 Migratory Birds

Impacts to migratory birds in the BPPA under the Proposed Action would be similar for all migratory bird species, but would vary depending on loss of habitat types and the species' sensitivity to disturbance. For the purposes of impact analyses in this EA, impacts to migratory birds within the BPPA are discussed together. Proposed surface disturbance estimates for vegetative communities under the Proposed Action, which provide habitats for migratory birds, are summarized in **Section 4.8**. The direct removal or fragmentation of vegetative communities utilized by migratory birds would persist for the LOP. However, successful reclamation, in conjunction with weed control efforts, would restore loss of nesting and foraging habitats for migratory birds over time.

Other impacts associated with the implementation of the Proposed Action would be dependent upon seasonal timing of construction, drilling, and completion activities. If these activities were to be conducted in the late fall, many of the migratory species would have left the BPPA for southern wintering grounds. Surface disturbance, visual, and noise impacts during this time would not impact most individual birds or nesting locations. However, if construction, drilling, and completion activities were to occur during the spring or summer months, the Proposed Action could result in temporary displacement from nesting habitats or deter nesting establishment. Fragmentation of habitat and associated edge avoidance by migratory birds has been documented as leading to lower levels in productivity (Renfrew et al. 2005). Associated noise and increased human presence could cause displacement from foraging and nesting habitats. If displaced birds move to less suitable habitats, an increase in competition, deteriorated physical condition, and a decrease in reproductive success could occur. Additional impacts to individual migratory birds could include potential increased mortality levels resulting from contact with petroleum-based products in reserve pits or asphyxiation in heater-treaters or fired vessels. However, the potential for these impacts to occur would be minimized or eliminated as Enduring Resources would remove any visible accumulation of oil from the drilling or workover pit immediately upon release of the drill rig. Furthermore, the applicant would install screens or other devices on the openings of heater-treaters or fired vessels, as directed by the AO (**Section 2.2.1.11**).

4.9.1.5 Special Status Species

Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a Federally-listed species or result in the adverse modification of designated critical habitat. If a Federal action **"*may affect, is likely to adversely affect*"** a Federally-listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the USFWS. It is the BLM's current policy that candidate species and sensitive species also are managed to prevent a future Federal listing as threatened or endangered.

Special Status Mammal Species

White-tailed Prairie Dog

Potential direct, adverse impacts to WTPD associated with oil and gas development include the following: habitat loss due to clearing and crushing of vegetation; fragmentation of available habitat due to pad construction, road development, and well operation; temporary displacement of animals; increased potential for vehicle collisions with prairie dogs; alteration of surface water drainages; and degraded habitat values due to increased soil compaction (USFWS 1990). Indirect effects to WTPD include increased pressure by shooters and OHV users caused by improved access into remote areas (Seglund 2004). Gordon et al. (2003) found that shooting pressure was greatest at prairie dog colonies with easy road access as compared to more remote colonies.

Implementation of the Proposed Action could result in the above-mentioned adverse impacts to WTPD colonies located in the southern portion of the BPPA. The development of proposed well pads and pipelines along East Bench Road would result in the direct loss of approximately 5 acres (or 5 percent) of mapped WTPD colonies. This would likely have the greatest effect on WTPD colonies when females and pups are most vulnerable (April – July 15) (Seglund 2004). However, as the above-estimated surface disturbance would result in minimal habitat loss for WTPDs, impacts to mapped WTPD colonies related to vegetation removal or habitat fragmentation would likely be minimal. In addition, if implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions to avoid active colonies could further reduce impacts to WTPD colonies.

Spotted Bat

Implementation of the Proposed Action would alter existing habitat as well as disturb a maximum of approximately 1,620 acres of spotted bat foraging habitat in the BPPA. As traffic within the BPPA would increase, specifically through canyons or near cliffs, roosting sites could be impacted and potentially abandoned. In addition, the loss of potential prey species and decreased availability and use of certain habitats through displacement, habitat fragmentation, and habitat modification could occur. However, as habitat for the spotted bat is widespread throughout eastern and southern Utah, the Proposed Action may affect individual spotted bats, but would not likely result in a trend towards Federal listing of the species.

Special Status Bird Species

Bald Eagle

Wintering bald eagles concentrate at established roosting sites for the purpose of feeding and sheltering in close proximity to sufficient food sources. Increased human presence, traffic, and associated noise level during the winter (early November to late March) could deter bald eagles from feeding or taking shelter. Disruptive activities in the flight path between important roosting and foraging areas may also interfere with feeding. Activities that permanently alter these habitats may eliminate essential elements for feeding and sheltering eagles within an area. As no bald eagle roosting sites are located within the BPPA and the closest documented roosting site is located approximately 20 miles west of the BPPA along the Green River, surface-disturbing activities under the Proposed Action would not likely deter wintering bald eagles from utilizing or selecting roosting sites along the Green River. However, these activities could affect bald eagles foraging within the BPPA.

Roadside carrion is one of the bald eagle's primary winter food sources. As the Proposed Action does not include provisions for the UDWR to remove carrion from BPPA roadways, shoulders, and ROWs, the potential for vehicle collisions with carrion-feeding bald eagles could increase in the BPPA as a result of

increased traffic levels. However, if implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions for operators and their contractors to comply with designated speed limits and contact the UDWR to remove carrion from roadways could minimize the potential for vehicle collisions with carrion-feeding bald eagles.

Indirect effects on bald eagles would include the loss of approximately 1,620 acres of prey species habitat (e.g., prairie dogs, rabbits, mice, small birds) associated with vegetation removal from project development. The loss of some prey species may limit foraging opportunities for individual eagles. Under the Proposed Action, reclamation efforts, in conjunction with implementation of a weed control plan, could somewhat restore prey habitat losses for foraging bald eagles over time.

Golden Eagle

Implementation of the Proposed Action could impact both breeding and wintering golden eagles, depending on the location of surface-disturbing activities and surface facilities relative to occupied territories, active or inactive nest sites, or wintering areas. Surface-disturbing activities in the proximity of an active golden eagle nest could potentially disturb breeding and nesting activities. Such disturbance could result in temporary displacement of eagles or avoidance of nesting sites caused by increased human activity, traffic, and traffic levels. Since golden eagles often alternate between nest sites within a breeding territory, any surface facilities where ongoing traffic or human presence occurs could prevent inactive nests from being used in the future. Under the Proposed Action, one well pad within the BPPA is proposed within ½-mile of a documented golden eagle nest. Such disturbance could result in temporary displacement from nesting sites and/or reduced nesting success.. However, as raptor management would be guided by "*Best Management Practices for Raptors and Their Associated Habitats in Utah*", impacts to this golden eagle nest site, and others within or near the BPPA, would be minimized to reduce the potential for temporary displacement or avoidance of nesting sites

Like the bald eagle, roadside carrion is one of the golden eagle's primary winter food sources. As the Proposed Action does not include provisions for the UDWR to remove carrion from BPPA roadways, shoulders, and ROWs, the potential for vehicle collisions with golden eagles could increase as a result of increased traffic levels in the BPPA. However, if implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions for operators and their contractors to comply with designated speed limits and contact the UDWR to remove carrion from roadways could minimize the potential for vehicle collisions with carrion-feeding golden eagles.

Vegetation removal associated with the Proposed Action would result in the indirect loss of about 1,620 acres of prey species habitat (e.g., ground squirrels, prairie dogs, and rabbits). The loss of some prey species may limit foraging opportunities for individual eagles. In addition, golden eagles may avoid hunting grounds where construction activities are taking place. Under the Proposed Action, reclamation efforts, in conjunction with implementation of a weed control plan, could somewhat restore prey habitat losses for golden eagles over time.

Ferruginous Hawk

Implementation of the Proposed Action could result in both direct and indirect impacts to the ferruginous hawk. Potential impacts to ferruginous hawks could include the following: 1) temporary displacement caused by increased human activity, traffic, and noise levels, and 2) indirect loss and fragmentation of prey species habitat.

The species is particularly susceptible to human-caused disturbances during courtship and incubation periods. Ferruginous hawks will abandon nests if disturbed prior to the eggs hatching (Wheeler 2003).

Construction, drilling, or completion activities could potentially disrupt breeding and nesting activities in the BPPA. Such disturbance could result in temporary displacement from nesting sites and/or reduced nesting success. However, as raptor management would be guided by "*Best Management Practices for Raptors and Their Associated Habitats in Utah*", impacts to ferruginous hawks would be minimized so as to reduce the potential for temporary displacement from, or avoidance of, nesting sites.

Indirect effects to ferruginous hawks would include the loss and fragmentation of approximately 1,620 acres of prey species habitat (e.g., ground squirrels, prairie dogs, jackrabbits, rabbits, small rodents, and birds) associated with vegetation removal from project development. The loss of some prey species may limit foraging opportunities for individual ferruginous hawks. Under the Proposed Action, reclamation efforts, in conjunction with implementation of a weed control plan, could somewhat restore prey habitat losses for ferruginous hawks over time.

Greater Sage-grouse

The East Bench and East Bench NE leks are considered to be unoccupied by UDWR (UDWR 2008a). While no males were observed at the East Bench 16 lek in 2008, given recent occupation (in 2007 and earlier) and per UDWR direction, measures to minimize impacts to sage-grouse within the BPPA are focused on this most recently occupied lek.

Under the Proposed Action, potential impacts to sage-grouse would include the following: decreased male attendance or abandonment of active leks; physical habitat loss and fragmentation; reduced habitat values due to the increased spread of weed species; increased predation by raptors and coyotes; and increased displacement of, or avoidance by, individuals due to increased human activity and noise levels.

As applicable, adherence to the following seasonal and spatial restrictions in the VFO ROD and Approved RMP could somewhat reduce the above-mentioned impacts to sage-grouse within the BPPA:

- No surface-disturbing activities would be allowed within 0.25 miles of active sage-grouse leks year round;
- No permanent facilities or structures would be constructed within 2 miles of sage-grouse leks when possible;
- No surface-disturbing activities would occur within 2 miles of active sage-grouse leks from March 1 through June 15; and
- Within 0.5 miles of known active leks, the best available technology would be used to reduce noise (e.g., installation of multi-cylinder pumps, hospital sound-reducing mufflers, and placement of exhaust systems) (BLM 2008).

Recent research by Holloran (2005) suggests that current development stipulations, such as those listed above, are inadequate to maintain greater sage-grouse breeding populations in natural gas fields. Holloran found that male lek attendance declined as the distance from leks to drill rigs, producing wells, and main haul roads decreased and as surface densities of these features increased. Holloran also found that lek attendance declined as traffic volumes and potential for greater noise increased, and when well densities exceeded approximately one well per section. Additionally, nesting females avoided areas with high well densities (selecting nesting habitat farther from active drilling rigs and producing wells), and brooding females avoided producing wells during the early brood-rearing period (Holloran 2005). Under the Proposed Action, up to 16 wells per section are proposed within 2 miles of the East Bench 16 lek (for a total of 61 well pads). Based on this well density, sage-grouse attendance of this lek could decline and

eventually, local extirpation of the active East Bench 16 lek could occur. Additionally, some hens could be excluded from suitable nesting and brooding habitats.

Holloran's research (2005) also suggests that the increase in relative occurrence of nest destruction by avian predators may be attributed to the attraction of corvid species (e.g., crows, ravens) to gas development. Breeding and non-breeding individuals may be attracted to human developments due to food source availability (Andren 1992; Linz et al. 1992). Ensuring that potential corvid food sources (i.e., trash, road-killed carrion) are removed from the gas field and perching deterrents are installed (Avery and Genchi 2004) on gas field-related structures could reduce corvid densitities within the gas field. Under the Proposed Action, avian predators could be attracted to perch sites associated with well development. If so, sage-grouse survival on the East Bench 16 lek could be reduced by foraging raptors.

Furthermore, under the Proposed Action, surface-disturbing activities would occur in various sage-grouse habitats. Disturbances in sage-grouse brooding habitat would occur throughout the BPPA and in sage-grouse winter habitat in the northwest corner (top of East Bench) of the BPPA. Sage-grouse rely almost exclusively on contiguous sagebrush ecosystems for leks, nesting sites, feedings sites, brooding sites, protection, and wintering grounds. As such, sage-grouse could be deterred from establishing brooding sites or using winter habitat based on the direct loss and fragmentation of these areas within the BPPA, as summarized below in **Table 4.9-2**. However, given the abundance of these habitats within the BPPA, estimated habitat losses could reduce relative habitat values for individual sage-grouse, but would not likely preclude the use of brooding or winter habitats within the BPPA.

Table 4.9-2 Surface Disturbances[1] to UDWR-identified Greater Sage-grouse Habitats within the BPPA under the Proposed Action

UDWR-identified Habitat Value	Total Habitat within the BPPA	Estimated Habitat Loss within the BPPA	Estimated percent of Habitat Loss within the BPPA
Crucial Brooding Habitat	34,471	1620	<5%
Winter Habitat	8,936	779	<9%

[1] Estimated surface disturbance is given in acres.

In addition to the Vernal ROD and Approved RMP restrictions listed above, implementation of recommended monitoring and mitigation measures (**Section 4.9.4.1**) could further reduce the above-mentioned impacts to sage-grouse associated with the East Bench 16 lek during the breeding season. These measures include provisions to fund annual lek inventories prior to surface-disturbing activities during the breeding season (if inventories have not already been completed for that year), limit surface density within a 2-mile radius of East Bench 16, screen leks (vegetatively and topographically), limit daily travel near leks during the breeding season, and use low-profile tanks to prevent raptor predation. Potential impacts to wintering sage-grouse in the BPPA could also be reduced if the exhaust stack on the proposed compressor station is pointed away from sage-grouse winter habitat. Additionally, adherence to mitigation to reduce surface density near East Bench 16 could indirectly reduce the potential for sage-grouse to abandon the active Sand Wash Rim lek, northwest of the BPPA.

Short-eared Owl

Implementation of the Proposed Action could result in direct and indirect impacts to short-eared owls. Direct impacts to short-eared owls could primarily include loss and fragmentation of nesting and foraging habitats. If breeding owls occur in the vicinity of construction activities between March 1 and August 1, the Proposed Action could result in impacts on breeding, nesting, and fledgling success. Short-eared owl nests are often located on the ground and are difficult to see in areas of dense vegetation. Active nests could potentially be missed during aerial or ground surveys and, therefore, could be subject to mortality

from collisions with construction vehicles or equipment. Indirect impacts could include displacement from foraging areas and reduction of prey species habitat.

As no short-eared owls have been identified within the BPPA, implementation of the Proposed Action would likely have minimal impacts on short-eared owls. Should short-eared owls be present or establish territories within or near the BPPA, the Proposed Action could result in temporary displacement of owls or their avoidance of ground nests in the vicinity of construction activities. However, as raptor management would be guided by "*Best Management Practices for Raptors and Their Associated Habitats in Utah*", impacts to short-eared owls would be minimized so as to reduce the potential for temporary displacement from, or avoidance of, nesting sites. In addition, successful reclamation, in conjunction with implementation of a weed control plan, could reestablish raptor and prey species habitat over time.

Burrowing Owl

If WTPD's are present in the BPPA, direct and indirect impacts to burrowing owls could result from implementation of the Proposed Action. Direct impacts could include loss and fragmentation of habitat, disturbance from noise and increased human activity, and increased mortality from collisions with construction vehicles. Indirect impacts could include displacement from foraging areas and interference with reproduction. If breeding burrowing owls are present in the vicinity of construction activities between March 1 and August 31, the Proposed Action could result in disturbances to breeding, nesting, and fledgling success.

Based on the presence of WTPD colonies within the BPPA, implementation of the Proposed Action could potentially affect burrowing owls. Should burrowing owls be present or establish territories within or near the BPPA, the Proposed Action could result in temporary displacement of owls or their avoidance of nesting habitats in prairie dog towns in the vicinity of construction activities. However, as raptor management would be guided by "*Best Management Practices for Raptors and Their Associated Habitats in Utah*", impacts to short-eared owls would be minimized so as to reduce the potential for temporary displacement from, or avoidance of, nesting sites. In addition, successful reclamation, in conjunction with implementation of a weed control plan, could reestablish raptor and prey species habitat over time. Furthermore, if implemented, recommended mitigation measures (**Section 4.9.4.1**) that include provisions to avoid active prairie dog colonies would indirectly reduce potential impacts to burrowing owls.

Sage Sparrow

The Proposed Action could result in direct and indirect impacts to sage sparrows. Direct impacts to sage sparrow would primarily include loss of shrubland nesting and foraging habitat, ultimately indirectly impacting breeding, nesting, and fledgling success. Such habitat loss and/or degradation would reduce the availability of seeds and insects common to the sage sparrow's diet. Other indirect impacts would include temporary displacement from foraging areas due to increased noise within the BPPA. Overall, the Proposed Action may affect individual sage sparrow, but given the amount of suitable shrubland habitat within and adjacent to the BPPA, the Proposed Action would not likely result in a trend towards Federal listing of the species.

Special Status Fish Species

Endangered Colorado River Fish

The Colorado pikeminnow, razorback sucker, bonytail, and humpback chub (collectively known as the endangered Colorado River fish) are affected by activities that degrade the flow of downstream waters into the Upper Colorado River Basin. The Proposed Action would utilize water for drilling and

completion from an existing water right (Permit #49-2279[T77865]; UDWR 2007). Water would be trucked in from the White River to various drilling locations and would constitute a depletion of the Upper Colorado Basin. For the purposes of analysis, it is assumed that additional water sources (other than Permit #49-2279[T77865]) would also deplete the Upper Colorado River Basin. Depletions can reduce the ability of the White and Green Rivers to create and maintain the physical habitat (areas inhabited or potentially habitable to the Colorado River fish for spawning, development of fish larvae, feeding, or serving as corridors between these areas) and the biological environment. Water depletions can also contribute to alterations in flow regimes that favor non-native fish.

In order to address depletion (and other) impacts on the endangered Colorado River fish, a Recovery Implementation Program for Endangered Fish Species in the Upper Colorado River Basin (Recovery Program) was initiated on January 22, 1988. Under the 1988 Recovery Program, any water depletions from tributary waters within the Colorado River drainage are considered to "*jeopardize the continued existence"* of these fish. In order to further define and clarify the recovery processes in the Recovery Program, a Section 7 agreement was implemented on October 15, 1993, by Recovery Program participants. Incorporated into this agreement is a Recovery Implementation Program Recovery Action Plan (RIPRAP). The RIPRAP identifies actions currently required to recover the endangered fish species in the most expeditious manner. Included in the RIPRAP was the requirement that a one-time depletion fee would be paid (based on the project's average annual depletion) to help support the Recovery Program for all non-historic water depletions (i.e., occurring after January 1988) from the Upper Colorado River Basin. The depletion fees ($18.29 per acre-foot for fiscal year 2008 - October 1, 2008, to September 30, 2009) were intended to be the reasonable and prudent alternative to avoid jeopardy to the endangered fishes caused by depletions to the Upper Colorado River Basin (USFWS 2008). In 1995 (and later amended in 1997), the USFWS eliminated water depletion fees for non-historical water depletions (permitted after January 1988) from the Upper Colorado River Basin of 100 acre-feet or less (USFWS 1995; USFWS 1997).

Under the Proposed Action, surface disturbance, including the construction of 20 well pads, is proposed in 100-year floodplains in the BPPA on BLM, State, and private lands. Surface disturbance of Bitter Creek's 100-year floodplain could lead to increased erosion, sediment yield, or spills to Bitter Creek. Sediment deposition or contaminants would subsequently enter the White River (approximately 5 miles downstream of the BPPA), thus affecting critical habitat for the Colorado pikeminnow at the confluence of Bitter Creek with the White River, and critical habitat for the razorback sucker, humpback chub, and bonytail further downstream in the Green River (approximately 20 miles west of the BPPA). The White and Green Rivers are both large rivers with high dilution factors. If a spill/leak were to enter the White River (and eventually the Green River), contaminants would likely accumulate in backwater/depressional areas that have reduced dilution and less flushing capacity (Woodward et al. 1985). The endangered Colorado River fish use these sites as a food source and to provide cover. Water quality is defined by parameters such as temperature, dissolved oxygen, environmental contaminants, nutrients, turbidity, and is considered a primary constituent element of designated critical habitat for Colorado River fish species. Research is limited regarding threats posed by environmental contaminants to the endangered Colorado River fish species (Woodward et al. 1985; Mayer and Ellersieck 1986). However, studies have shown that contaminants, including petroleum hydrocarbons released via spills/leaks, can affect behavioral functions which have been shown to impair feeding behavior (Woodward et al. 1987). Early life stages of all fish are generally more sensitive to environmental contaminants than to juveniles and adults (Mayer and Ellersieck 1986), and disruption of behavioral functions can result in population declines or changes in year-class strength if enough individuals are affected (Little et al. 1993).

Where development activities and construction are proposed within 100-year floodplains, implementation of recommended mitigation measures would alleviate adverse impacts to the endangered Colorado River fish and their USFWS-designated critical habitats in the White and Green Rivers. These mitigation

measures (**Section 4.9.4.1**) include avoidance of riparian and wetland areas, diverting stormwater runoff from facilities, utilizing appropriate erosion control measures, lining tank battery berms, and the installation of closed-loop drilling systems. Adherence to these mitigation measures would reduce the potential for increased erosion and sediment yield to the White River, as well as divert runoff in the event a spill. Additionally, impacts related to the increased potential for exposure to hazardous substances could be minimized by compliance with SPCC regulations.

Based on the potential for non-historic water depletions from the Upper Colorado River Basin, as described above, the Proposed Action **"*may affect, is likely to adversely affect*"** the Colorado River fish and their USFWS-designated critical habitats in the White and Green Rivers. As such, Section 7 consultation with the USFWS would be required to evaluate impacts to the Colorado River fish and their critical habitats.

Sensitive Colorado River Fish

Impacts to the roundtail chub, bluehead sucker, and flannelmouth sucker would be similar in nature to those listed above for the endangered Colorado River fish. As such, under the Proposed Action, increased erosion and sedimentation to area drainages and the increased potential for contamination of the White River (and eventually the Green River) would affect the sensitive Colorado River fish and habitat for these species in the White and Green Rivers. Where development activities and construction are proposed within 100-year floodplains, implementation of recommended mitigation measures would alleviate adverse impacts to the sensitive Colorado River fish and their habitats in the White and Green Rivers. These mitigation measures (**Section 4.9.4.1**) include avoidance of riparian and wetland areas, diverting stormwater runoff from facilities, utilizing appropriate erosion control measures, lining tank battery berms, and the installation of closed-loop drilling systems. Additionally, impacts related to the increased potential for exposure to hazardous substances could be minimized by compliance with SPCC regulations. Adherence to these mitigation measures would reduce the potential for increased erosion and sediment yield to the White River, as well as divert runoff in the event of a spill, such that the Proposed Action could affect individual fish, but would not likely result in a trend towards Federal listing of the roundtail chub, bluehead sucker, or flannelmouth sucker.

Special Status Reptile Species

Utah Milk Snake

Construction activities (e.g., vegetation and soil excavation, equipment and vehicle movement, etc.) could result in the direct mortality of Utah milk snakes occupying construction zones and would result in a loss of sagebrush habitat, which provides potential habitat for the species. Increased use of roadways and traffic within Utah milk snake habitat could also increase the potential for mortality of individuals via collisions. Indirect impacts to the Utah milk snake include displacement and loss of year-round habitat for prey species (e.g., small mammals, birds, reptiles, and reptile eggs). Under the Proposed Action, reclamation efforts, in conjunction with implementation of a weed control plan, could somewhat restore prey habitat losses for the utah milk snake over time.

Overall, the Proposed Action may affect individual Utah milk snakes through habitat loss, displacement, mortality, or loss of prey base, but would not likely result in a trend towards Federal listing of the species.

4.9.2 ALTERNATIVE B – NO ACTION

Under Alternative B, impacts to wildlife, including special status wildlife and fishery species, and their habitats within the BPPA (or downstream of the BPPA as in the case of fish) would be similar in nature to

those described above under the Proposed Action (**Section 4.9.1**); however, impacts to these species would be less under Alternative B as less development would occur within the BPPA. Similar to the Proposed Action, if implemented, recommended mitigation measures (**Section 4.9.4.1**) could substantially reduce or minimize several potential adverse impacts to wildlife, including special status wildlife and fishery species, within or downstream of the BPPA (as in the case of fish).

4.9.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Under Alternative C, impacts to wildlife, including special status wildlife and fishery species, and their habitats within or downstream of the BPPA (as in the case of fish) would be similar in nature to those described above under the Proposed Action (**Section 4.9.1**). However, impacts to sage-grouse and special status fish species would be less under Alternative C based on specific actions to further minimize impacts to these species in sensitive areas. Specifically, impacts to sage-grouse that occupy East Bench 16 would be less under Alternative C as Enduring Resources would fund annual lek inventories prior to surface-disturbing activities during the breeding season (if inventories have not already been completed for that year), surface density would be limited to 80-acre spacing within a 2-mile radius of the lek (for a total of 44 well pads or a 28 percent reduction from the Proposed Action), the lek would be screened by vegetation and topography, daily travel would be limited near active leks during the breeding season, and low-profile tanks would be used to prevent raptor predation. Indirectly, impacts to sage-grouse that occupy Sand Wash Rim would also be less under Alternative C based on reduced surface density surrounding the East Bench 16 lek. Impacts to wintering sage-grouse in the BPPA would also be less under Alternative C as the point exhaust stack on the proposed compressor station would be pointed away from sage-grouse winter habitat. These measures could reduce impacts to sage-grouse, such that abandonment of the East Bench 16 or Sand Wash Rim leks would be less likely to occur. Impacts to fish related to the direct removal or degradation of riparian and wetland areas, increased erosion and sediment deposition, and the potential contamination of Bitter Creek or other area drainages would also be less under Alternative C as less development would occur in 100-year floodplains. Under Alternative C, four well pads would be constructed within 100-year floodplains, which constitute an 80 percent reduction in the number of well pads proposed under the Proposed Action. In addition, specific actions to line tank battery berms in 100-year floodplains and utilize closed-loop systems within or immediately adjacent to 100-year floodplains would prevent contamination of area drainages and downstream habitats in the event of an accidental spill, leak, or flood. Further, specific actions to avoid wetland and riparian areas and use of erosion control methods would minimize project-related sediment yield to Bitter Creek and other area drainages. These measures would most effectively reduce impacts to special status fish, but could also substantially reduce or minimize potential adverse impacts to other wildlife, including special status wildlife species, that occur in the BPPA.

4.9.4 MITIGATION MEASURES

If the following recommended mitigation measures are implemented, direct and indirect impacts to wildlife species, including special status wildlife and fisheries, could be reduced. These recommended mitigation measures are organized by wildlife type, but many could have indirect mitigation effects on all species within the BPPA. Unless explicitly noted, the mitigation measures listed below are recommended for all alternatives. Project personnel of the operator and their contractors would be educated on, and subject to, the following requirements within the BPPA:

4.9.4.1 Mitigation Measures for Wildlife, Including Special Status Wildlife and Fishery Species

General Wildlife

- The operator and any contractors would comply with designated speed limits to minimize the potential for wildlife and vehicle collisions.

Raptors, Including Special Status Raptors

- The operator and any contractors would contact the UDWR to remove carrion from the roadways, shoulders, and ROWs.

White-tailed Prairie Dogs

- As feasible, the placement of well pads and, roads on or through active prairie dog colonies would be avoided.

Greater Sage-grouse (Alternatives A and B only)

- Prior to any construction, drilling, or completion activities between March 1 and June 15, the BLM and/or a third party contractor would first coordinate with UDWR to see if annual lek inventories have been completed within the BPPA. If surveys have not been conducted for that year, the operator would fund a site-specific lek inventory to determine lek activity. If leks are determined to be active, Enduring Resources would adhere to sage-grouse restrictions listed in the Vernal ROD and Approved RMP (BLM 2008a).
- Surface density would be limited to 80-acre spacing (with 40-acre downhole spacing) within 2-miles of the East Bench 16 sage-grouse lek.
- Low-profile tanks would be used within 1 mile of the East Bench 16 sage-grouse lek.
- As feasible, project facilities would be located out of the line-of-sight from sage-grouse leks. Sage-grouse leks would also be obscured from noise-related impacts, using vegetative and/or topographic screening, as directed by the AO during the onsite process.
- The exhaust stack would be pointed away from sage-grouse winter habitat to reduce noise levels in sensitive use areas.
- Timing of energy exploration, development, and construction would be adjusted to minimize disturbance of sage-grouse breeding activity at dawn and dusk when birds are likely to be found on the leks (Connelly et al. 2000).

Endangered and Sensitive Colorado River Fish (Alternatives A and B only)

- In accordance with the Vernal RMP (BLM 2008a), no new surface-disturbing activities would be allowed within active floodplains, wetlands, public water reserves, or within 100 meters of riparian areas. An exception could be authorized if:

    - There are no practical alternatives,
    - Impacts could be fully mitigated, or
    - The action is designed to enhance the riparian resources.

  If an exception is authorized:

- All well pads located within or immediately adjacent to the 100-year floodplains of Bitter Creek would feature a closed-loop system. The need for closed-loop systems at individual well pads would be determined by the AO during the onsite process. No well pads would be located within the active channel.
- Proposed well pads located within 100-year floodplains would be surrounded by berms to divert surface water from the facility. Silt fencing or other approved erosion control methods would also be utilized, as deemed necessary by the SMA, during the APD process.
- Tank batteries would be centralized outside of the floodplain where topographically feasible; those constructed within the 100-year floodplain would be bermed and the berm would be lined with plastic.

4.10 TRANSPORTATION

4.10.1 ALTERNATIVE A - PROPOSED ACTION

During peak drilling, an estimated 103 roundtrips would be generated on a daily basis. For the remainder of the construction and drilling phase, 74 roundtrips would be generated on a daily basis. This is a projected increase of approximately 8 percent on Highway 88, State Highway 45, and Glen Bench Road and a projected increase of approximately 19 percent on Seep Ridge Road.

Once production begins, and for the remainder of the project's life, there would be minimal traffic associated with routine operations. At full development, Enduring Resources estimates that about 21 pumpers (each responsible for 32 wells) would be needed to maintain facilities on a daily basis. In addition, an average of six trucks per day would be needed to haul produced water and condensate from the BPPA.

Construction of up to 664 wells would require construction of approximately 65 miles of new access roads or upgraded two-tracks. Roads collocated with pipeline(s) would be constructed within a 45-foot ROW. The initial disturbance associated with the construction of new access roads or upgraded two-tracks would be approximately 355 acres. At the end of the construction phase, portions of access roads that are not needed for routine operations would be reclaimed in accordance with the requirements of the appropriate SMA. Roads collocated with pipeline would be reduced to a 30 foot ROW.

Road construction and improvement has the potential to increase soil erosion, which can reduce surface water quality and adversely impact aquatic habitat. In addition, road construction and improvement can reduce visual quality, open roadless land to motorized access, impact paleo-geologic and cultural resources, and affect wildlife and livestock through loss of available forage and habitat fragmentation. Each of these potential impacts is addressed within the appropriate resource sections.

The direct and indirect impacts associated with increased traffic would be fugitive dust generation, vehicle emissions, road congestion, noise, accelerated deterioration of roads, increased potential for vehicle accidents, and potential conflicts between industrial and recreational traffic.

4.10.2 ALTERNATIVE B – NO ACTION

Under the No Action Alternative, no drilling would be permitted on Federal leases; however, approximately 53 well pads could be constructed on State and private lands from which up to 112 wells could be drilled.

Approximately 11 miles of new access roads or upgraded two-tracks would be needed to access the proposed wells. The initial disturbance caused by road construction would be approximately 69 acres. Portions of access roads that are not needed for routine operations would be reclaimed once the wells begin production. Direct and indirect impacts from transportation would be similar in nature, although smaller in magnitude, to those described for the Proposed Action.

4.10.3 ALTERNATIVE C- LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Similar to the Proposed Action, estimated roundtrips under Alternative C would be between 103 and 74 vehicles per day. At full development, Enduring Resources estimates that about 21 pumpers (each responsible for 32 wells) would be needed to maintain facilities on a daily basis. In addition, an average of five trucks per day would be needed to haul produced water and condensate from the BPPA. Construction of 664 wells would require the construction of approximately 60 miles of new access roads or upgraded two-tracks. Roads collocated with pipeline would be constructed within a 45-foot ROW. The initial disturbance associated with the construction of new access roads or upgraded two-tracks would be approximately 327 acres. Direct and indirect impacts from transportation would be similar in nature and magnitude to those described for the Proposed Action.

4.10.4 MITIGATION MEASURES

No additional mitigation measures beyond those discussed in Chapter 2 are recommended.

4.11 LIVESTOCK AND GRAZING

AUM loss associated with livestock grazing in the Project Area has the potential for impacts in the three grazing allotments. Increased roads within the Project Area would contribute to difficulties in controlling livestock as more natural barriers to livestock movement are removed, and as more livestock use roads as travel routes. The impacts posed by the three alternatives are analyzed in detail below.

4.11.1 ALTERNATIVE A – PROPOSED ACTION

The Proposed Action would result in the removal of 1,090 acres of usable vegetation in grazing allotments in the Project Area. As a result of the disturbance, there would be a total loss of 75 AUMs. **Table 4.11-1** provides a breakdown of estimated loss of livestock AUMs by grazing allotment. As shown, activities under the Proposed Action would result in an approximately 0 to 5 percent reduction of vegetation/forage in allotments within the Project Area.

Table 4.11-1. Proposed Action Effects on Grazing Allotments

Name	Usable* Acres in Project Area	Active AUMs in Project Area	Disturbance in Project Area (Acres)	Active AUMs Lost in Project Area	Percent AUMs Lost in Project Area
Olsen AMP	20,159	1,391	1,068	74	5
Sand Wash	11	1	0	0	0
Sunday School Canyon	1,210	86	22	2	2
Total	**21,380**	**1,478**	**1,090**	**75**	**---**

*Usable acreage on slopes less than or equal to 40 percent slope and on BLM-administered lands only.

Indirect effects to livestock grazing could consist of reduced forage quality due to potential weed infestations; increased gas development-related traffic; potential traffic delays to ranchers accessing the Project Area during construction and drilling phases; and a potential increase in vehicle and livestock collisions due to increased traffic.

Specific actions under the Proposed Action would reduce direct and indirect impacts to livestock and related facilities. These actions include noxious weed control and monitoring, interim and final reclamation, and maintaining integrity of cattle fences to prevent livestock movement. Adherence to these measures would reduce impacts to livestock and livestock facilities in the Project Area. Furthermore, if implemented, recommended mitigation measures (**Section 4.11.4**) that include provisions to avoid range facilities and ponds by 300 feet, as directed by the AO, would reduce potential impacts to livestock and grazing resources.

4.11.2 ALTERNATIVE B – NO ACTION

Impacts to general livestock grazing and facilities under Alternative B would be similar to those under the Proposed Action, but lower in magnitude as less surface disturbance would occur under Alternative B. Well development under this alternative would only occur on State and private lands, therefore impacts to BLM livestock facilities and grazing would be restricted to those caused by development of road and pipelines required to access State and private wells. Throughout all lands in the Project Area (including Federal, State and private), Alternative B would result in the removal of 20 acres of usable vegetation in grazing allotments in the Project Area (an 83 percent reduction from the Proposed Action). As a result of the road and pipeline disturbance on BLM lands, there would be a total reduction of two usable AUMs in the Project Area. **Table 4.11-2** provides a breakdown of estimated loss of livestock AUMs by grazing allotment. As can be seen, activities under Alternative B would result in approximately 0 percent to less than 1 percent reduction of vegetation/forage in areas of allotments within the Project Area.

Table 4.11-2. Alternative B Effects on Grazing Allotments

Name	Usable* Acres in Project Area	Active AUMs in Project Area	Disturbance in Project Area (Acres)	Active AUMs Lost in Project Area	Percent AUMs Lost in Project Area
Olsen AMP	20,159	1,391	20	1	<1
Sand Wash	11	1	0	0	0
Sunday School Canyon	1,210	86	0	0	0
Total	**21,380**	**1,478**	**20**	**1**	**---**

*Usable acreage on slopes less than or equal to 40 percent slope and on BLM-administered lands only.

If implemented, recommended mitigation measures (**Section 4.11.4**) that include provisions to avoid range facilities and ponds by 300 feet, as directed by the AO, would reduce potential impacts to livestock and grazing resources.

4.11.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Impacts to livestock resources under Alternative C would be similar to those discussed under the Proposed Action, but slightly lower in magnitude as less surface disturbance would occur under Alternative C. Alternative C would result in the removal of 986 acres of usable vegetation in grazing allotments in the Project Area. As a result of the disturbance, there would be a total reduction of 69

AUMs. As shown on **Table 4.11-3**, activities under Alternative C would result in an approximately 0 to 5 percent reduction of vegetation/forage in areas of allotments within the Project Area.

Table 4.11-3. Alternative C Affects on Grazing Allotments

Name	Usable Acres in Project Area	Usable AUMs in Project Area	Disturbance in Project Area (Acres)	AUMs Lost in Project Area	Percent AUMs Lost in Project Area
Olsen AMP	20,159	1,391	964	67	5
Sand Wash	11	1	0	0	0
Sunday School Canyon	1,210	86	22	2	2
Total	**21,380**	**1,478**	**986**	**69**	**---**

*Usable acreage on slopes less than or equal to 40 percent slope and on BLM-administered lands only.

If implemented, recommended mitigation measures (**Section 4.11.4**) that include provisions to avoid range facilities and ponds by 300 feet, as directed by the AO, would reduce potential impacts to livestock and grazing resources.

4.11.4 MITIGATION

Range facilities and ponds would be avoided by 300 feet as directed by the AO.

4.12 RECREATION

The potential adverse impacts to recreation from natural gas development in the BPPA would consist primarily of lost recreational opportunities or diminished recreational experience within and near the Project Area.

4.12.1 ALTERNATIVE A - PROPOSED ACTION

Under the Proposed Action, 292 well pads, 105 miles of pipeline, and 65 miles of new access roads would be constructed within the Project Area. Surface disturbance associated with the new well pads, associated facilities, roads, and pipelines would be visible to hunters, OHV users, and other dispersed recreational users throughout much of the Project Area. The shift to a more industrialized landscape, in combination with an increase in noise and traffic associated with construction, drilling, and completion activities would diminish the recreation experience of visitors in the Project Area as a whole but especially in those areas that currently have a more primitive nature. Individuals that are attracted to backcountry recreation (especially in those areas east of the Bates Knolls Road in the lower Bitter Creek area) would encounter new roads, oil and gas facilities, and human activity (e.g., dust, traffic, and noise) in an area where limited surface disturbance has occurred to date. Impacts would be greatest during the construction, drilling, and completion phases, but would continue throughout the production phase. Impacts would be isolated geographically to the site being developed and limited in time, in that visual and auditory disturbances would primarily occur during the construction and development period. Impacts to primitive and unconfined recreation would be partially mitigated by painting all production facilities to blend with the natural landscape, centralizing production facilities on two of the six well pads, and use of low profile tanks.

Increased noise and human activity, from construction, drilling, and operations, as well as noise from the compressor, would likely result in displacement of game species from portions of the BPPA, which would impact hunting.

The 65 miles of new access roads within the Project Area would provide recreational users with increased access to broader portions of the area, some of which were previously not accessible by vehicle. While it is not a prevalent recreational use area, the additional roads and improved access could also expand trail-related recreational opportunities (such as OHV use and hunting).

4.12.2 ALTERNATIVE B - NO ACTION ALTERNATIVE

Effects of surface disturbance on recreational activities and experiences in the BPPA would similar in nature to that described for the Proposed Action, but would be lower in magnitude due to the reduced level of development.

4.12.3 ALTERNATIVE C – LIMITED SURFACE DISTURBANCE WITHIN SENSITIVE RESOURCE AREAS

Under Alternative C, 291 wells pads and associated facilities (65 miles of collocated road and pipeline and an additional 39 miles of pipeline) would be constructed within the Project Area. Effects of surface disturbance on recreational activities and experiences in the area would be nearly identical to that described for the Proposed Action.

4.12.4 MITIGATION

No additional mitigation measures beyond the applicant committed environmental protection measures described in Chapter 2 have been identified.