

**U.S. Department of the Interior
Bureau of Land Management
Colorado River Valley Field Office
2300 River Frontage Road
Silt, Colorado 81652**

ENVIRONMENTAL ASSESSMENT

NEPA NUMBER

DOI-BLM-CO-N040-2013-0067-EA

CASEFILE NUMBER

Federal Oil and Gas Lease: COC24603

PROJECT NAME

Proposal to Drill One Federal Horizontal Well from the Existing GM 32-4 Pad Located on BLM Land in the Riley Gulch Area Northwest of Parachute, Garfield County, Colorado.

PAD LOCATION

Township 7 South (76S), Range 96 West (R96W), Section 4, Lots 2, 3 and 5, SW¹/₄NE¹/₄, Sixth Principal Meridian. The project would be located approximately 6.3 miles northwest of Parachute, Garfield County, Colorado along the lower reaches of Riley Gulch (Figure 1).

APPLICANT

WPX Energy Rocky Mountain, LLC (“WPX”). Contact: Greg Davis, 1001 Seventeenth Street, Suite 1200, Denver, Colorado 80202.

PURPOSE AND NEED FOR THE ACTION

The purpose and need of the Proposed Action is to analyze WPX’s proposal to drill a horizontal exploratory well from the GM 32-4 pad and develop Federal lease COC24603 to the benefit of the public by producing Federal fluid mineral resources (natural gas, liquid condensate, and associated petroleum hydrocarbons) currently trapped within the target geologic formation.

BACKGROUND

The GM 32-4 well pad with four producing Federal oil and gas wells was originally analyzed and approved in the Environmental Assessment (EA) for the South Grand Valley Geographic Area Plan (SGVGAP) #CO-140-2004-0034-EA, signed on April 13, 2004 (BLM 2004). The GM 32-4 well was initially spudded on September 9, 1998, with first sales occurring in November 1998. The 2004 SVGAP EA analyzed a second follow-up drilling visit when the other three Federal wells were drilled and completed in 2006. The interim reclamation of the GM 32-4 pad was accomplished in 2008-2009 with little success in the reestablishment of desirable vegetation on the reclaimed area.

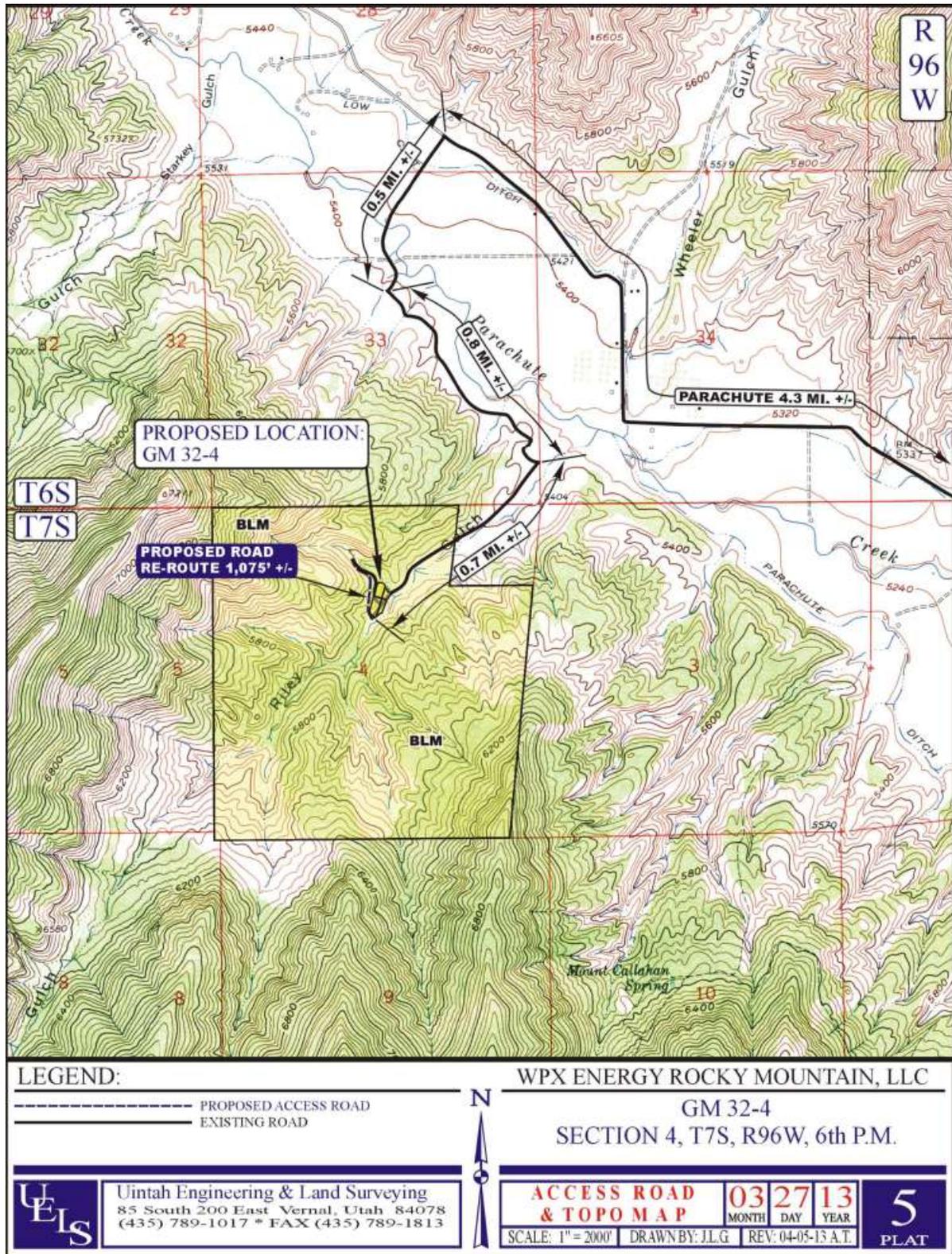


Figure 1. Project Location Map.

In summer-fall 2012, the operator, WPX Energy Rocky Mountain LLC (WPX, formerly Williams Production RMT Company), drilled its first horizontal exploratory well (GM 701-4-HN1) in the region from the GM 41-4 pad, which lies approximately 2,000 feet east of the proposed GM 702-4-HN1 horizontal well on the GM 32-4 pad. WPX has chosen the GM 32-4 location specifically to allow the second horizontal well bore to be located in proximity to the initial exploratory well to further enhance its knowledge of the target geologic formation.

ALTERNATIVES

Proposed Action

WPX proposes to drill and develop one new Federal oil and gas well from the expanded GM 32-4 well pad located on BLM. The Federal well would be horizontally drilled into underlying Federal lease COC24603 (Table 1). The GM 32-4 pad presently supports four producing Federal wells. The GM 32-4 pad would be expanded to provide space to conduct the horizontal well drilling and completion and stage the associated production equipment, and a new road serving the nearby GR 21-4 pad would be constructed (Figure 2). The pad expansion would have a maximum cut of 26.2 feet at the north corner and a maximum 7.9 feet of fill at the northeastern corner.

Table 1. Surface and Bottomhole Locations of Proposed Federal Well		
<i>Proposed Well</i>	<i>Surface Location (Section 4, T7S, R96W)</i>	<i>Bottomhole Location (Section 9, T7S, R96W)</i>
Federal GM 702-4-HN1	SW¼NE¼, 1401 fee FNL 2354feet FEL	SW¼NW¼, 1974 feet FNL 1702 feet FEL

The GM 32-4 project would involve the following components:

- (1) Expanding the GM 32-4 pad from its 0.52-acre reclaimed area to a 4.76-acre disturbance footprint, which includes constructing 1,075 feet of new access road to the nearby GR 21-4 pad and installing production units (separators) and water-condensate storage tanks on the expanded pad (Figure 2).
- (2) Drilling the Federal GM 702-4-HN1 oil and gas well horizontally into nearby Federal lease.
- (3) Storing drill cuttings from the wellbore in a storage area on the west side of the pad (Figure 2).
- (4) Conducting well completion operations on the GM 32-4 pad after the drilling is finished and rig is demobilized
- (5) Laying 2,163 feet of two collocated 10-inch diameter poly surface pipelines from the GM 41-4 pad to the GM 32-4 pad to deliver water to support well completion work on the GM 32-4 pad (Figure 3)
- (6) Installing 1,025 feet of buried 4-inch diameter Flexpipe water line in the new GR 21-4 road corridor to collect produced water from the GR 21-4 wells into the existing Riley Gulch water gathering line (Figure 3)
- (7) Burying 3,554 feet of new 12-inch steel gas pipeline in a 40-foot-wide corridor along Riley Gulch Access Road between the GM 32-4 pad and Williams Midstream existing 30-inch gas trunk line located in Lot 11, Section 34, T6S, R96W (1.22 acres of new disturbance)(Figure 3).
- (8) Installing 1,025 feet of buried 3-inch steel gas pipeline in the new GR 21-4 road corridor to deliver the natural gas produced from the GR 21-4 wells into the new 12-inch gas pipeline (Figure 3).

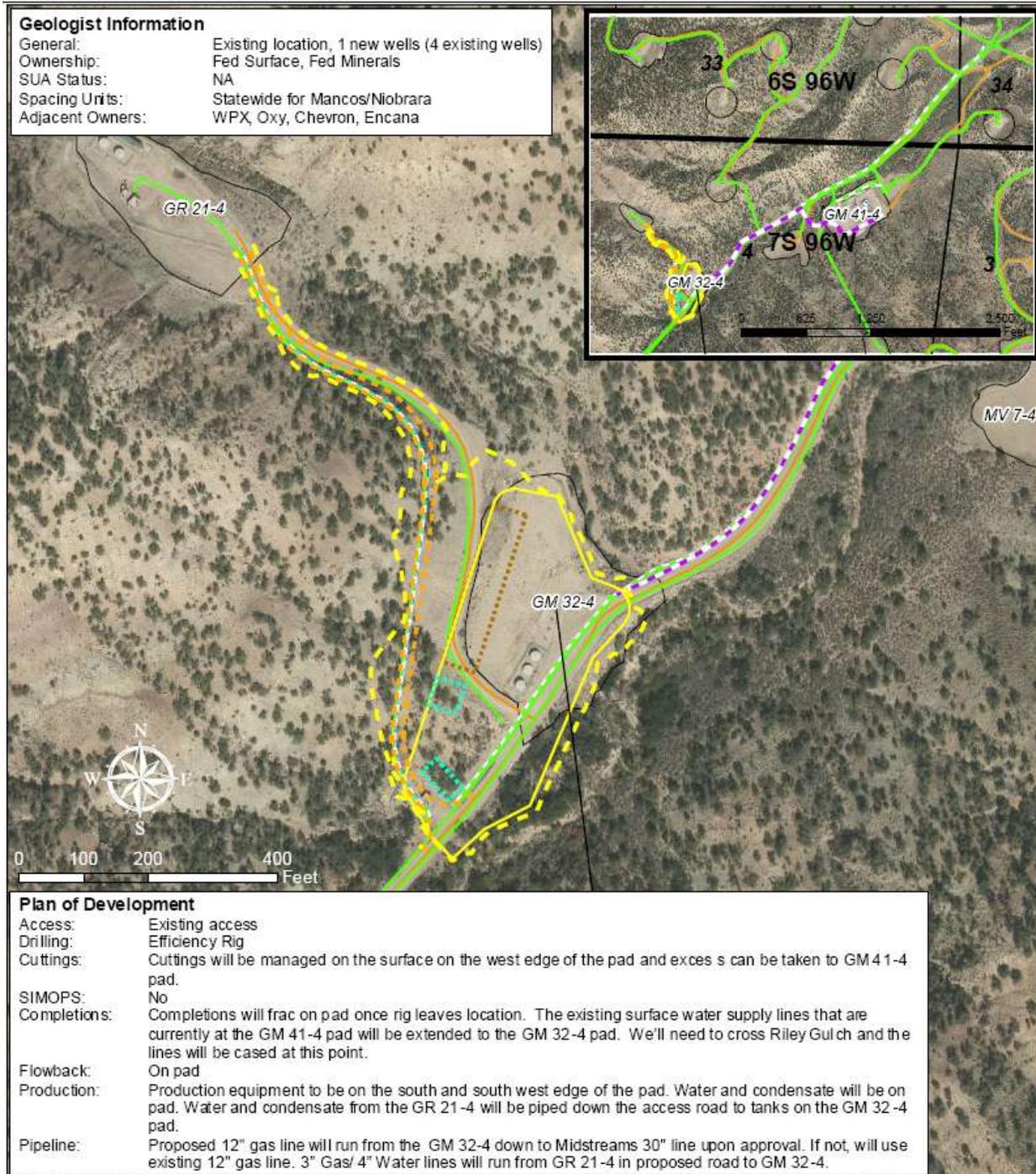


Figure 3. GM 32-4 Plan of Development.

The total surface disturbance associated with this project would be 8.27 acres which is comprised of 4.98 acres of new surface disturbance and 3.29 acres of existing disturbed areas (Table 2). Approximately 6.29 acres of the total disturbance would occur on BLM land. After interim reclamation of the pad and reclamation of temporarily disturbed areas along the roads and pipeline, long-term disturbance on BLM would be 1.93 acres.

Table 2. Project Surface Disturbance (initial/long-term acres)			
<i>New Disturbance</i>	<i>Private</i>	<i>BLM</i>	<i>Total</i>
Expanded GM 32-4 Pad	--	2.72/1.32	2.72/1.32
New GR 21-4 Road Alignment	--	1.04/0.61	1.04/0.61
Proposed 12-inch Gas Pipeline (15-foot width alongside Riley Gulch Road)	0.75/--	0.47/--	1.22/--
Subtotal	0.75/--	4.23/1.93	4.98/1.93
<i>Existing Disturbance</i>	<i>Private</i>	<i>BLM</i>	<i>Total</i>
Existing GM 32-4 Pad	--	0.52	0.52
Existing GR 21-4 Road	--	0.48	0.48
Proposed 12-inch Gas Pipeline (25-foot width across Riley Gulch Road)	1.25	1.04	2.29
GR 21-4 Gas and Water Pipelines (buried within GR 21-4 road corridor)	--	--	--
Subtotal	1.25	2.04	3.29
TOTAL DISTURBANCE	2.00	6.29/1.93	8.27/1.93

The existing GM 32-4 pad would be expanded and the GR 21-4 access road realigned, creating 4.76 acres of total surface disturbance for the site (all on BLM land). The 12-inch gas pipeline upgrade would contribute 1.22 acres of new surface disturbance along the Riley Gulch Road of which 0.47 acres would occur on BLM. An additional 2.29 acres of disturbance would occur within the Riley Gulch Road corridor to store the trench spoils in order to accomplish the 12-inch pipeline installation. There are no surface disturbance allotments for the surface water delivery lines between the GM 32-4 and GM 41-4 pads or the new water and gas lines serving the GR 21-4 pad since such work would occur within existing disturbances.

To provide the drilling and cuttings storage space for the new well and provide safe roadway access across the pad for Riley Gulch exploration and production traffic, the GM 32-4 pad would be expanded primarily along its northern and western edge. Because the pad would be excavated northward, the existing GR 21-4 access road would be realigned to follow the expanded extent of the GM 32-4 pad allowing for an improved road grade to the GR 21-4 pad (Figure 4). The eastern edge of the pad would be slightly expanded closer to Riley Gulch to provide the necessary space to allow traffic across the pad during the well drilling and completion process. The closest pad edge to Riley Gulch (Corner 12) would remain within the original disturbance footprint with the use of a rock retaining wall structure.

Topsoil would be stripped during the initial earthwork, windrowed, where possible, in available locations around the pad perimeter, and designed to serve as storm water controls. Diversion ditches would be constructed to direct surface flow around the pad perimeter; pad grading and surfacing with gravel would be accomplished to direct runoff to the diversion ditches and avoid water ponding on the pad surface.

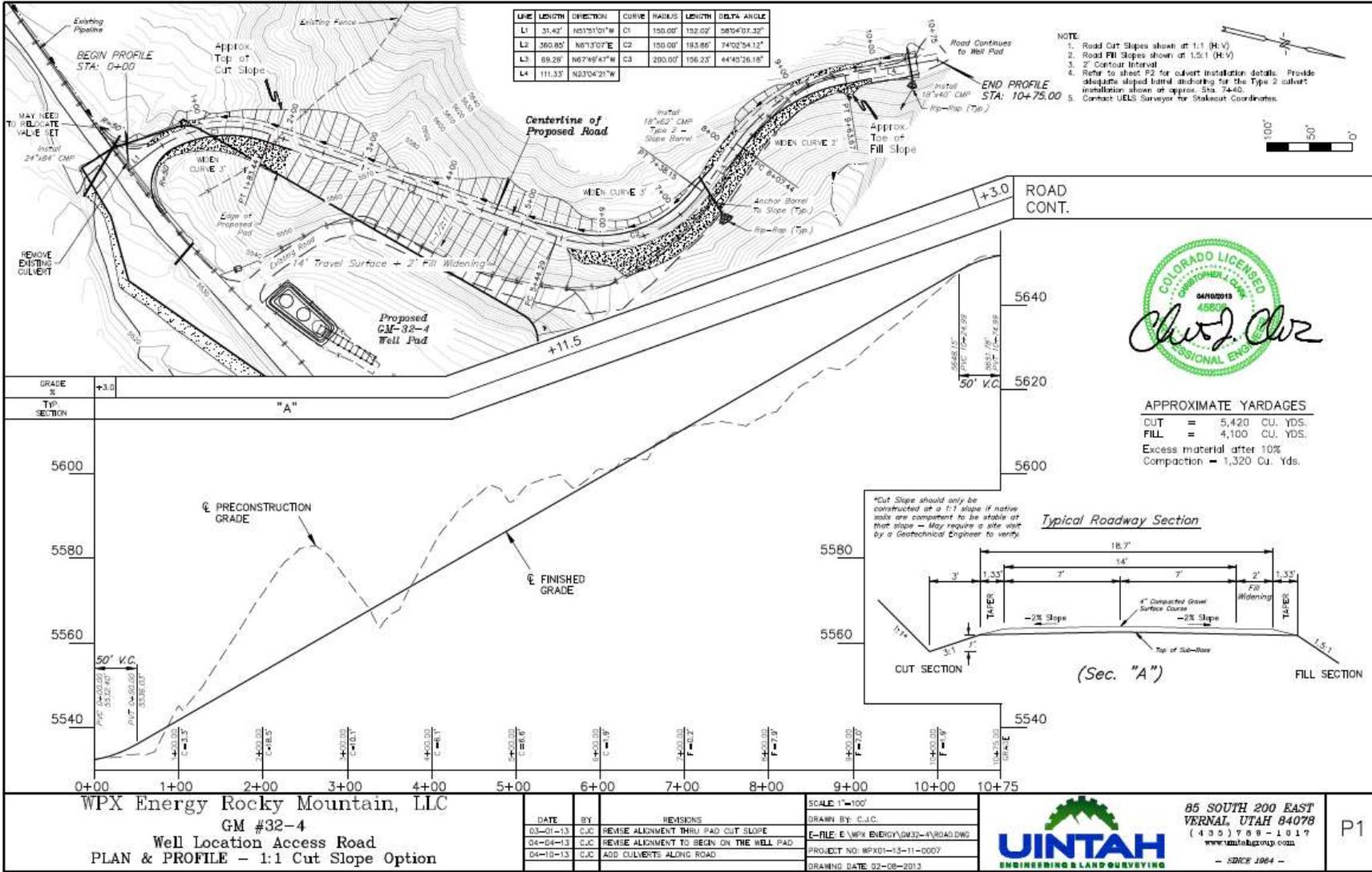


Figure 4. GR 21-4 Access Road Plan and Profile

The proposed pad work has a considerable volume of excess material (31,790 cubic yards) which would be used for the following purposes (in priority order): (a) placed along Riley Gulch Road below the pad entrance to reduce the steep road grade onto the pad, (b) placed along Riley Gulch Road above or west of the pad to improve road drainage and road grades onto the west side of the pad, stored along the old GR 21-4 unneeded roadway above Corner 9, and hauled to GR 21-4 pad for placement against the steep unreclaimed cutslope.

Temporary 10-inch poly surface water lines would be fused together between the GM 32-4 pad on BLM and the nearby GM 41-4 pad on private land to deliver and receive waters in support of the well completion operations. The surface water lines would cross Riley Gulch within steel casing above the culvert location on the MV 7-4 pad access road (Figure 1). The lines would be tested with air prior to being placed into service. Cuttings generated during drilling of the proposed wells would be dried with shaker systems installed on the drill rig, mixed with inorganic materials to aid in the drying, and stored in the cuttings management area along the west side of the pad cutslope (Figure 2).

The road, pipeline, and pad construction work would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). A minimum 6-inch depth of gravel would be applied to the Riley Gulch access road and new GR 21-4 access road prior to commencement of any drilling operations. A road maintenance program would be required during the production phase of the well which includes, but is not limited to blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. Roads would be maintained in a safe and usable condition.

The Proposed Action would include well drilling and remote well completion, production of natural gas and associated liquid condensate, proper handling and disposal of produced water, and interim and final reclamation. Water for drilling and well completion operations would be trucked from approved sources via existing State, County, and/or Fee lease roads.

The Proposed Action would be implemented consistent with the Federal oil and gas lease, Federal regulations (43 CFR 3100), and the operational measures included in the Applications for Permit to Drill (APDs). Section 7.0 of this BA lists the specific Surface-Use Conditions of Approval (COAs) to be implemented as conservation measures for this project. The operator would be responsible for continuous inspection and maintenance of the access roads, pads, and pipelines.

Resource surveys, including those for cultural resources, nesting raptors, and special status plants and animals, were completed in conjunction with the planning for this project. An updated biological report for the pad location and surroundings was conducted in April 2013 (WWE 2013).

The northwest extent of the project falls within potentially suitable habitat for DeBeque phacelia (*Phacelia submutica*), a plant species Federally listed as threatened under the Endangered Species Act (ESA). Informal consultation with U.S. Fish and Wildlife Service (USFWS) personnel in Grand Junction, Colorado, was conducted by BLM, CRVFO staff botanist, Judy Perkins. WPX retained WestWater Engineering (WWE) of Grand Junction, Colorado, to prepare the Biological Assessment for the consultation process. Special Status Species section provides a discussion of the conservation measures designed to mitigate project impacts to the DeBeque phacelia suitable habitat.

No Action Alternative

The No Action Alternative would constitute denial of the Federal APD described in the Proposed Action, meaning that the proposed Federal well would not be drilled or developed, the GM 32-4 pad expansion and

GR 21-4 road realignment would not occur, and the installation of the buried gas pipelines and surface frac water lines would not occur. No new surface disturbances on BLM land would occur.

PLAN CONFORMANCE REVIEW

The Proposed Action and No Action Alternative are subject to and have been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

Name of Plan: The current land use plan is the *Glenwood Springs Resource Management Plan (RMP)*, approved in 1984 and revised in 1988 (BLM 1984). Relevant amendments include the *Oil and Gas Plan Amendment to the Glenwood Springs Resource Management Plan* (BLM 1991) and the *Oil & Gas Leasing & Development Record of Decision and Resource Management Plan Amendment* (BLM 1999a).

Decision Language: The 1991 Oil and Gas Plan Amendment (BLM 1991) included the following at page 3: “697,720 acres of BLM-administered mineral estate within the Glenwood Springs Resource Area are open to oil and gas leasing and development, subject to lease terms and (as applicable) lease stipulations” (BLM 1991, page 3). This decision was carried forward unchanged in the 1999 ROD and RMP amendment at page 15 (BLM 1999b).

Discussion: The Proposed Action is in conformance with the 1991 and 1999 RMP amendments cited above because the Federal mineral estate proposed for development was designated as open to oil and gas leasing and development, and Federal lease COC24603 was duly issued pursuant thereto. In addition, the 1999 RMP amendment requires multi-year development plans known at that time as Geographic Area Plans (GAPs) for lease development over a large geographic area. The current project is within the area covered by the *South Grand Valley GAP* (CO140-2004-034-EA) and also meets GAP exception criteria in the 1999 RMP Amendments based on its small size and location along existing access roads. Therefore, the Proposed Action is in conformance with the current land use plan.

SUMMARY OF LEASE STIPULATIONS

The Federal well would be horizontally drilled from the expanded GM 32-4 pad located on BLM land. Table 3 lists the applicable stipulations shown on Federal oil and gas lease COC24603.

Table 3. COC24603 Lease Stipulation		
<i>Lease Number</i>	<i>Description of Lands</i>	<i>Stipulations</i>
COC24603 (1976)	ALL LANDS within lease	An environmental assessment shall be prepared for the purpose of insuring proper protection of the surface, the natural resources, the environment, existing improvements and for assuring timely reclamation of disturbed lands. Submission of plan of operations assuring adequate protection of drainages, waterbodies, springs, fish and wildlife habitat, steep slopes or fragile soil. Protection of Cultural Resources.

STANDARDS FOR PUBLIC LAND HEALTH

In January 1997, Colorado BLM approved the Standards for Public Land Health. The five standards cover upland soils, riparian systems, plant and animal communities, threatened and endangered species, and water quality. Standards describe conditions needed to sustain public land health and relate to all uses of the public lands. The environmental analysis must address whether impacts resulting from the Proposed Action or

alternatives being analyzed would maintain, improve, or deteriorate land health conditions relative to these resources. These analyses are conducted in relation to baseline conditions described in land health assessments (LHAs) completed by the BLM. The Proposed Action would be implemented in an area included in the Rifle West Watershed LHA (BLM 2005).

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

During its internal scoping process for this Environmental Assessment (EA), pursuant to the National Environmental Policy Act (NEPA), BLM resource specialists identified the following elements of the natural and human environment as present in the project vicinity and potentially affected by the project:

Access and Transportation	Native American Religious	Vegetation
Air Quality	Concerns	Visual Resources
Cultural Resources	Noise	Wastes – Hazardous and Solid
Fossil Resources	Socioeconomics	Water Quality – Surface and Ground
Geology and Minerals	Soils	Wildlife – Aquatic, Migratory Birds, and Other Terrestrial
Invasive Non-Native Plants	Special Status Species	

Access and Transportation

Affected Environment

The project area is accessed from the BLM office in Silt, Colorado, by driving west on Interstate 70 (I-70) to the Parachute exit (#75) then northwest on Parachute Creek Road (County Road [CR] 215) approximately 4.3 miles and across oil and gas development roads for another 2 miles across Parachute Creek to the lower reaches of Riley Gulch. Although the pad is located on BLM, no public access is available to the project site as the access road originates from CR 215 on private land.

Environmental Consequences

Proposed Action

Although the access roads serving the pad are suitable for the planned development, a new 1,075-foot access road serving the GR 21-4 pad would be constructed directly adjacent to the GM 32-4 pad. The 14-foot-wide road (24-foot-wide roadway including bar ditch) would be constructed as identified in the road plan and profile attached in the APD resulting in 1.04 acres of new disturbance and another 0.48 acres occurring within existing disturbances on BLM. After reclamation of the road cuts and fills, the long-term disturbance for the new road would total 0.61 acre.

The Proposed Action would result in a substantial increase in truck traffic related to the development of the initial well and potentially the 10 to 14 additional wells that could be drilled at the location. The largest increase would be during rig-up, drilling, and completion activities. Data indicate that approximately 1,160 truck trips over a 30-day period would be required to support the drilling and completion of each well (Table 4). Once the wells are producing, traffic would decrease to occasional visits for monitoring or maintenance activities. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days.

Degradation of field development roads may occur due to heavy equipment travel and fugitive dust and noise would be created. Mitigation measures (Appendix A) would be required as COAs to ensure adequate dust abatement and road maintenance occur.

Table 4. Traffic Associated with Drilling and Completion Activities		
<i>Vehicle Class</i>	<i>Number of trips per well</i>	<i>Percentage of total</i>
16-wheel tractor trailers	88	7.6%
10-wheel trucks	216	18.6%
6-wheel trucks	452	39.0%
Pickup trucks	404	34.8%
Total	1,160	100.0%

Source: BLM 2006. Note: Trips by different vehicle types are not necessarily distributed evenly during the drilling process. Drilling and completion period is approximately 30 days per well.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts related to access and transportation.

Air Quality

Affected Environment

Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area, regional air quality monitoring has been conducted in Rifle and elsewhere in Garfield County. Air pollutants measured in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), particulate matter less than 10 microns (μ) in diameter (PM₁₀), and particulate matter less than 2.5 μ in diameter (PM_{2.5}).

The project area lies within Garfield County, which has been described as an attainment area under CAAQS and NAAQS. An attainment area is an area where ambient air pollution quantities are below (i.e., better than) NAAQS standards. Regional background values are well below established standards, and all areas within the cumulative study area are designated as attainment for all criteria pollutants. The Garfield County Quarterly Monitoring Report summarizing data collected at monitoring sites in Parachute, Silt, Battlement Mesa, and Rifle in January through June 2012 (the most recent posting) confirms continuing attainment of the CAAQS and NAAQS (Garfield County 2012). Federal air quality regulations are enforced by the Colorado Department of Public Health and Environment (CDPHE).

Federal air quality regulations adopted and enforced by CDPHE through the Clean Air Act (CAA) Prevention of Significant Deterioration (PSD) Program limit incremental emissions increases of air pollutants from certain sources to specific levels defined by the classification of air quality in an area. Incremental increases in PSD Class I areas are strictly limited, while increases allowed in Class II areas are less strict.

The project area and surrounding areas are classified as PSD Class II, as is Dinosaur National Monument, located approximately 180 miles to the northwest. PSD Class I areas located within 100 miles of the project area are Flat Tops Wilderness (approximately 25 miles north), Maroon Bells – Snowmass Wilderness (approximately 35 miles south), West Elk Wilderness (approximately 60 miles southeast), Black Canyon of the Gunnison National Park (approximately 65 miles south), and Eagles Nest Wilderness (approximately 60 miles east).

Proposed Action

The CDPHE, under CAA delegated authority from the U.S. Environmental Protection Agency (EPA) and in conformance with Colorado’s State Implementation Plan (SIP), is the agency with primary responsibility for air quality regulation and enforcement in connection with industrial developments and other air pollution sources in Colorado. Unlike the conceptual “reasonable but conservative” engineering designs used in NEPA analyses, CDPHE air quality preconstruction permitting is based on site-specific, detailed engineering values, which are assessed in CDPHE’s review of the permit application.

The GM 32-4 project as described in the Proposed Action includes constructing, drilling, completing, and operating one new Federal horizontal well resulting in a short-term surface disturbance of 8.27 acres with 6.29 acres occurring on BLM. Of these totals, the existing GM 32-4 pad would be expanded and the GR 21-4 access road would be realigned creating 4.76 acres of surface disturbance on BLM. The 12-inch gas pipeline upgrade would contribute 1.22 acres of new surface disturbance along the Riley Gulch Road of which 0.47 acres would occur on BLM. There are no surface disturbance estimates for the surface water delivery lines to be laid between the GM 41-4 and GM 32-4 pads or the new water and gas lines serving the GR 21-4 pad since they would be buried within the new GR 21-4 road corridor. The long-term surface disturbance for this project would occur on BLM and amount to 1.93 acres for the working area of the GM 32-4 pad and the GR 21-4 roadway.

Air quality in the project area would decrease during construction of access roads, pads, and pipelines and drilling and completion of the wells.

Pollutants generated during construction activities would include combustion emissions and fugitive dust (PM₁₀ and PM_{2.5}) associated with earthwork and construction equipment. Once construction activities are complete, air quality impacts associated with construction would cease and impacts would transition to emissions associated with transportation of drilling and completion equipment. Fugitive dust and vehicle emissions from mobilization of equipment necessary for the drilling and completions phase and rigging up the drill rig would occur during the transitions between construction, drilling and completions phases. During drilling and completions work air quality impacts would be caused by emissions from generators and engines to run equipment, onsite and offsite vehicle traffic, and escaped and flared gasses during drilling and flowback phases. Following the completion of these phases, emissions would be greatly reduced to emissions associated with long-term natural gas and condensate production.

The CRVFO analyzes air quality impacts of oil and gas development projects using results of a regional air model prepared by Tetra Tech, Inc. and its subcontractor, URS Corporation, in October 2011. The modeling addressed the cumulative impacts of incremental oil and gas development in the CRVFO by assuming a range of future Federal (BLM and USFS) and private wells and associated facilities such as compressors, storage tanks, and roads. The modeled scenarios also incorporated different levels of mitigation. The “no action” scenario assumed a total of 5,106 future Federal (BLM plus USFS) wells with mitigation sufficient to meet CDPHE and EPA regulations and emissions standards. Other scenarios included as many as 6,640 Federal wells and associated facilities in a “maximum development” scenario in combination with more stringent mitigation to meet or exceed State and Federal regulations and standards. For all scenarios analyzed, the

estimated impacts to air quality are below the current NAAQS, CAAQS, PSD increments, and visibility and deposition thresholds.

The modeling also estimated cumulative impacts from future Federal plus private wells in the CRVFO, ranging from a total of 12,072 wells in the “no action” scenario to 15,664 wells in the “maximum development” scenario. During the modeling, estimated future emissions from wells in the CRVFO were added to background air quality levels, major stationary sources, and an additional 28,843 future Federal plus private wells outside the CRVFO but within the modeling domain. These additional wells were based on estimated numbers for three other BLM field offices in the modeling domain—White River Field Office (Meeker, Colorado), Little Snake Field Office (Craig, Colorado), and Vernal Field Office (Vernal, Utah).

Methods and results of the modeling are presented in an Air Resources Technical Support Document (ARTSD) (BLM 2011), available for viewing at the CRVFO in Silt, Colorado, and on its website.

Emissions addressed in the air quality model included greenhouse gases (GHGs), “criteria pollutants” (CO, NO₂, SO₂, ozone, PM₁₀, and PM_{2.5}), and hazardous air pollutants (HAPs) including BTEX (benzene, ethylbenzene, toluene, and xylenes), formaldehyde, and n-hexane. The model also addressed potential impacts on visibility due to particulates and “photochemical smog” (caused by chemical reactions in the atmosphere) and on lake chemistry of selected pristine lakes due to modeled deposition rates of sulfur and resultant impacts on acid neutralizing capacity of the lake waters.

For the maximum level of future oil and gas development modeled, the visibility analysis predicted a slight impact (1 day per year with a reduction in visibility of 1 deciview or greater) in the Flat Tops Wilderness and no days with 1 deciview or greater reduction in visibility at all other modeled Class I and II receptors. For the remaining pollutants analyzed, modeled levels of future oil and gas development within the CRVFO would have no or negligible long-term adverse impacts on air quality. Since the Proposed Action is within the scope of the future development modeled, no significant adverse impacts on air quality are anticipated.

The current Proposed Action includes WPX design components and BLM mitigation requirements (Appendix A) among those analyzed in the air quality model. These include use of directional drilling to reduce the number of well pads, piping instead of trucking of fluids to a centralized collection facility, flaring instead of venting of natural gas during well completions, self-contained flare units to minimize emissions to the atmosphere, and use of closed-loop drilling. Closed-loop drilling minimizes emissions by recycling drilling muds and separating fluids and drill cuttings, thus eliminating open pits containing petroleum fluids. In addition to minimizing emissions associated with drilling and completion activities, these mitigation measures would also significantly reduce fugitive dust and vehicle tailpipe emissions by greatly reducing the volume of truck traffic required to support the operations.

Generation of fugitive dust as a result of construction activities and travel on unpaved access roads would also be reduced by BLM’s requirement that WPX apply gravel to a compacted depth of 6 inches on the access road, apply water to the access road during the development phase, and apply a BLM-approved dust suppressant throughout the long-term production phase (Appendix A). In addition, construction activities for the well pad, access road, and pipelines would occur between the hours of 7:00 a.m. and 6:00 p.m. each day, which is generally a more favorable period for atmospheric dispersion due to warmer temperatures and less stable air. Fugitive dust emissions from vehicular traffic during drilling and completion would be further reduced if, as planned under the Proposed Action, these activities are allowed to occur during the winter season, when roads are frozen, snow-covered, or wet.

Emissions of volatile organic compounds (VOCs) such as the BTEX constituents of condensate vary depending on the characteristics of the condensate, the volume produced, and tank operations. Operators are required to control emissions of VOCs from condensate tanks under CDPHE Regulation 7. If deemed

necessary by the State, the operator may be required to install a vapor recovery or thermal destruction system to further reduce VOC concentrations.

Ongoing scientific research has identified the potential impacts of “greenhouse gases” (GHGs) and their effects on global atmospheric conditions. These GHGs include carbon dioxide, methane, nitrous oxide, water vapor, and several trace gases. Through complex interactions on a global scale, these GHG emissions are believed by many experts to cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat energy radiated by the Earth back into space.

In 2001, the Intergovernmental Panel on Climate Change (IPCC) predicted that by the year 2100, global average surface temperatures would increase 1.4 to 5.8°C (2.5 to 10.4°F) above 1990 levels. The National Academy of Sciences (NAS) supports these predictions, but has acknowledged that there are uncertainties regarding how climate change may affect different regions. In 2007, the IPCC also concluded that “warming of the climate system is unequivocal” and “most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic (man-made) greenhouse gas concentrations” (NAS 2007). Other theories about the effect of GHGs on global climate change exist.

An inventory and assessment of GHG emissions from oil and gas projects in the CRVFO was included in the air quality modeling completed in October 2011. In all of the modeled development scenarios, annual GHG emissions from Federal wells in the CRVFO would no more than 0.5% of Colorado emissions from natural gas projects in 2008 and 0.0009% of U.S. emissions from natural gas projects in 2005 (EPA 2010). The lack of scientific tools designed to predict climate change on regional or local scales limits the ability to quantify potential future impacts of climate change on the specific area of the Proposed Action. While any oil and gas development project may contribute GHGs to the atmosphere, these contributions would not have a significant effect on a phenomenon occurring at the global scale believed by some to be due to more than a century of human activities.

Based on the information presented in this section, including results of the air quality model prepared for the BLM in October 2011, the Proposed Action is not expected to have significant adverse impacts on air quality.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts on air quality.

Cultural Resources

Affected Environment

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take in to account the effects their actions will have on cultural resources. As a general policy, an agency must consider effects to cultural resources for any undertaking that involves Federal monies, Federal permitting/authorization, or Federal lands.

Three Class III (intensive pedestrian survey) cultural resource inventories (CRVFO# 981, 1198-5 and 1107-33) have been conducted within the proposed project area for the original GM 32-4 pad construction, access roads, and/or pipelines. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records identified no cultural resource within project

Area of Potential Effect (APE). Several eligible or “need data” sites (5GF.143, 5GF1185, and 5GF1186) are in the project vicinity, but outside the APE. Eligible or potentially eligible cultural sites are referred to in Section 106 of the National Historic Preservation Act as “historic properties.”

Environmental Consequences

Proposed Action

No cultural resources have been identified within the proposed project APE. Therefore, the BLM has made a determination of “**No Historic Properties Affected.**” This determination was made in accordance with the 2001 revised regulations [36CFR 800.4(d)(1)] for Section 106 of the National Historic Preservation Act (16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement and Colorado Protocol]. As the BLM has determined that the Proposed Action would have no direct impacts to known “historic properties,” no formal consultation was initiated with the SHPO.

Although unlikely, indirect, long-term cumulative damage from increased access and the presence of project personnel could result in a range of impacts to known and undiscovered cultural resources in the vicinity of the project location. These impacts could range from accidental damage or vandalism, illegal collection and excavation.

An Education/Discovery COA for cultural resource protection will be attached to the EA. The importance of this COA would be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered during construction operations.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to cultural resources.

Fossil Resources

Affected Environment

The predominant bedrock formation present at or near the surface within the project is the Shire Member of the Wasatch Formation. This formation is overlain by areas of Quaternary aged pediment gravels and alluvial sands and muds. Occurring in varying thicknesses, these Quaternary sediments are considered Potential Fossil Yield Classification Class 2, defined as having a low probability of fossil occurrence. Class 2 geologic units are not likely to contain vertebrate or scientifically significant invertebrate fossils.

The Wasatch Formation is considered a BLM Condition 4 formation, defined as an area that is known to contain vertebrate fossils or noteworthy occurrences of invertebrate fossils. These types of fossils are known to occur or have been documented, but may vary in occurrence and predictability. The Wasatch Formation is divided into the early Eocene Shire, and the Paleocene age Molina and Atwell Gulch members; while the Eocene aged Green River Formation is divided into the Parachute Creek, Garden Gulch, Douglas Arch, Cow Ridge, and Anvil Points members.

All members of the Wasatch Formation contain vertebrate fossils in varying abundances (Murphy and Daitch 2007). Rocks of the Wasatch Formation are lithologically very similar to one another throughout the Piceance Creek Basin as heterogeneous continental fluvial deposits with interfingering channel sandstone

beds and overbank deposits consisting of variegated claystone, mudstone, and siltstone beds (Franczyk et al. 1990). Eocene-age mammals have been found in the lower part of the Shire member.

Fossils historically identified in the Wasatch are archaic mammals—including marsupials, representatives of two extinct orders of early mammals (pantodonts and creodonts), artiodactyls (deer-like even-toed ungulates), ancestral horses and other perissodactyls (odd-toed ungulates), carnivores, and primates—as well as birds, lizards, turtles, crocodylians, gars and other fishes, freshwater clams, gastropods (snails), and other invertebrates (BLM 1999a).

Environmental Consequences

Proposed Action

Although mapped as the predominant surface formation of the project area, field inspection revealed the Wasatch exposed only in a few outcrops found on cliff faces and landslide exposures. The thickness of the Quaternary sediments cannot be accurately determined, but construction activities have the potential to adversely affect important fossils that may be present in the underlying Wasatch and Green Formations. The greatest potential for impacts is associated with excavation of shallow bedrock that may be unearthed during well pad and facilities (especially pipeline) construction. In general, alluvium, colluvium, and other unconsolidated sediments are much less likely than bedrock to contain well-preserved fossils.

An examination of the BLM paleontology database indicates four fossil localities within a 2-mile radius of the proposed well sites, the nearest located approximately 4,000 feet north. Four of the discoveries are located in Section 14, but north of the proposed well sites. Areas covered with vegetation and soil cover do not usually yield fossil resources, but inspections would be conducted for proposed facilities that are located on or within 200 feet of Wasatch Formation bedrock surface exposures. In the event paleontological resources are encountered, a standard paleontological COA would be attached to the APDs (Appendix A).

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts on fossil resources.

Geology and Minerals

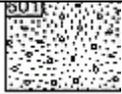
Affected Environment

The project area is located near the eastern margin of the Colorado Plateau physiographic province (Fenneman 1946), a region characterized by dissected plateaus of strong relief. A broad, asymmetric, southeast-northwest trending structural basin, the Piceance Basin contains stratified sediments ranging in age from Cambrian through middle Tertiary up to 20,000 feet thick. The basin lies between the White River uplift to the northeast, the Gunnison uplift to the south, and the Uncompahgre swell to the west (George 1927, Weiner and Haun 1960). Table 5 lists the geologic formations within the project area.

The predominant bedrock exposures within the proposed development area are the Tertiary Wasatch Formation. The Wasatch Formation consists of variegated claystone, siltstone, and sandstones and ranges from 1,000 to 2,500 feet thick. The Wasatch Formation is underlain unconformably by the Mesaverde Group. The Mesaverde Group is composed of mudstones and sandstones with interlayered coal beds and ranges in

thickness from about 3,000 to over 7,000 feet. The Mesaverde Group has also been referred to as the Mesaverde Formation, which includes informal subdivisions based on gas productivity characteristics.

Table 5. Geologic Formations within the Study Area

<i>Map Symbol</i>	<i>Lithologic Pattern</i>	<i>Formation Name</i>	<i>Age</i>	<i>Characteristics</i>	<i>Location</i>
Qalc		Alluvium of the Colorado River	Holocene	Mud, Silt and Gravel	Lowermost floodplain of the Colorado River.
Qal		Alluvial and floodplain deposits.	Holocene	Mud, Silt, Sand and Gravel. Locally derived	Fan and sheet wash deposits.
Qp		Pediment Gravel Deposits	Pleistocene	Angular to subrounded slabby pebble and cobble gravels.	Outcrops and cliff faces.
Tws		Shire Member – Wasatch Formation	Eocene/ Paleocene	Variegated purple, lavender, red gray and brown claystone.	Steep slopes and outcrops.

Source: Donnell et al. 1986

In the proposed development area, the Wasatch Formation is mantled by unconsolidated sedimentary surface deposits of Quaternary age in the form of earthflow deposits. The thickness of these unconsolidated sediments is uncertain, but the depth to the underlying Wasatch Formation may be determined during construction excavation.

The Iles Formation of the Mesaverde Group is the target zone of the proposed drilling program. Comprised of the Williams Fork and Iles Formations, sediments of the Mesaverde Group are marine sandstones transitional to non-marine beds of coal, shale, and sandstone. These sediments were deposited marginal to the great Cretaceous seaway. The oscillating shoreline of this sea, due to the rise and fall of sea level, left behind a complex of transgressive and regressive sedimentary sequences of nearshore and offshore sediments that define the Mesaverde Group.

Production is derived from three reservoir intervals, which include the Wasatch, Williams Fork, and Iles Formations. The latter two make up the Upper Cretaceous Mesaverde Group. The proposed drilling program would target the sandstone sequences of the Upper Williams Fork Formation, which provide most of the natural gas production volumes (Lorenz 1989). The upper portions of the Williams Fork include fluvial point bar, floodplain, and swamp deposits. The Lower Williams Fork Formation includes delta front, distributary channel, strandplain, lacustrine and swamp environments (Hemborg 2000), while the sandstones and coalbeds of the Iles Formation were deposited in a wave-dominated coastal setting (Johnson 1989, Lorenz, 1989). The source rocks are interbedded and thermally mature gas-prone shales, mudstones, siltstones, and coals. The reservoir rocks are the fine to medium-grained Williams Fork sandstones, varying in thickness from less than 10 feet to more than 50 feet (Spencer and Wilson 1988), creating an interbedded relationship between source and reservoir. The trapping mechanism of the gas is both stratigraphic and diagenetic.

No commercial deposits of coal, oil shale, uranium, precious metals, limestone, sand and gravel, gypsum, or other leasable, locatable, or salable minerals are believed to occur within or beneath the project area.

Environmental Consequences

Proposed Action

If the proposed wells are proven feasible, initial production rates would be expected to be highest during the first few years of production, then decline during the remainder of the economic lives of the wells. Substantial reserves have been known to be trapped within the tight sands of these reservoirs since the late 1950s, but only within the last decade, and particularly within the last few years, has the integrated application of new technologies turned the tight gas sands of the Mesaverde Group into a profitable play (Kuuskraa 1997). Natural fracture detection, advanced log analysis, more rigorous well completions and recompletions, and denser spacing have increased the amount of recoverable gas within these reservoirs.

Natural gas production from the proposed wells would contribute to the draining of hydrocarbon-bearing reservoirs within the Mesaverde Group in this area, an action that would be consistent with BLM objectives for mineral production. Hydraulic fracturing would be utilized to create fractures within the formation to allow gas production from the wells. In recent years, public concern has been voiced regard potential impacts of hydraulic fracturing from “micro-earthquakes” and from contamination of freshwater aquifers. This issue is addressed in the section on Water Resources – Ground.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts on geologic resources.

Invasive Non-Native Plants

Affected Environment

Colorado’s listed noxious weeds are designated by the Colorado Department of Agriculture, and management of these weeds is regulated under the Colorado Noxious Weed Act, Title 35, Article 5.5. The Colorado noxious weed list is broken down into tiered levels based on existing infestation levels and a tiered approach to weed management. List A weeds are targeted for eradication, List B species are targeted for containment to limit spread, and List C species are targeted for integrated weed management including biocontrols, additional education resources, and research.

The proposed project area lies within the steep, narrow drainage of Riley Gulch, ranging in elevation from 5,365 feet, at the beginning of the proposed pipeline near the confluence of Riley Gulch and Parachute Creek, to 5,600 feet at the top of the road re-route to the GR 21-4 well pad. Riley Gulch is an intermittent tributary of Parachute Creek, fed in upper portions by perennial springs but becoming intermittent in its lower reaches. Vegetation in the project areas vicinity is a mix of pinyon-juniper woodlands and sagebrush shrublands, with a sparse band of riparian vegetation immediately adjacent to Riley Gulch. Steep surrounding slopes and ridgelines have rock outcrops and areas with sparse to no vegetation. The soils are high in clay content, derived from the upper Wasatch Formation. This type of habitat is particularly vulnerable to annual grass and forb invasive species in the upland areas, while the wash bottoms provide excellent habitat for invasive shrubs and trees, including tamarisk.

Botanical surveys conducted for this project in April 2013, and in overlapping project areas in May and June 2012, searched for noxious weeds and other non-native invasive plant species. Overall, the project area is not heavily infested with weeds. Cheatgrass (*Bromus tectorum*), a State List C noxious weed, is present and

sparsely scattered within the project area. No other noxious weed species were found. However several non-native plant species were present that are not state-listed as noxious in Colorado. These species, found primarily along existing roads and well pad peripheries and in other disturbed sites, included bur butterwort (*Ceratocephala testiculata*), salsify (*Tragopogon dubius*), yellow sweetclover (*Melilotus officinale*), and crested wheatgrass (*Agropyron cristatum*). Crested wheatgrass is a non-native perennial pasture grass introduced from Eurasia and widely planted in the western U.S. to improve forage on rangeland degraded by overgrazing of livestock and for reclamation of roadcuts, mined lands, and other disturbed lands. Although easily established in these situations, crested wheatgrass is an aggressive competitor that can significantly impede or prevent establishment of native grasses and forbs. Yellow sweetclover, also widely planted in seed mixes uses for reclamation or range improvement, behaves as an aggressive weed that, unlike crested wheatgrass, can spread into areas where it may outcompete established natives.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 8.27 acres would be disturbed, of which 6.29 acres would be on BLM land, and 1.98 acres would be on private land. Of the total 8.27 acres of disturbance, 4.98 acres would be new disturbance (4.23 acres on BLM land and 0.75 acres on private), and 3.29 acres would be in existing disturbance. Following interim reclamation of the GM 32-4 well pad and reclamation of temporarily disturbed areas along the roads and pipeline, long-term disturbance would remain on 1.93 acres of BLM land.

Surface-disturbing activities, such as those proposed for this project, provide a niche for invasion and establishment of non-native plant species particularly when these species are already present in the surrounding area. The mechanisms for this invasion and establishment are multi-fold. Removal of native vegetation removes the competition from native plants for resources, including water and soil nutrients, opening up niches for invasive species. Linear disturbances, such as roads, provide corridors of connected habitat along which invasive plants can easily spread. Well pad construction and subsequent well drilling and operations activities require construction equipment and motorized vehicles, which often transport invasive plant seeds either alone or in mud clods on the vehicle undercarriage or tires and deposit them in disturbed habitats along access roads and at well pad sites. Noxious weeds and other invasive species are well-adapted to colonize and dominate in disturbed ground. They generally do not require well-developed soils, can out-compete native species for resources, produce prodigious quantities of seeds, and have seeds which can survive for many years or even decades within the soil. When weeds establish on a site, they can also significantly alter the composition of the soil microbial community of bacteria and fungi, making it increasingly more difficult over time for native species to reestablish on the site. Due to the quantity and longevity of weed seeds and the effects of weeds on the soil, once these invasive species have established on a site they can be extremely difficult to eliminate.

Because the project area is relatively weed-free, the potential risk for spreading weeds within the project area is relatively low. However, cheatgrass is present in the area and could be spread during construction activities. New disturbance would also provide habitat for increased establishment of cheatgrass and other non-native invasive species. Vehicles and equipment associated with project implementation could also transport new noxious weed species to the site, where they would have disturbed habitats in which to establish. To mitigate this invasive species risk, the standard weed control COA would be attached to APDs to require periodic monitoring and weed control practices to ensure that these weedy plants are controlled (Appendix A). Establishment of native plant species is also crucial in preventing invasive non-native plant species establishment and spread. Therefore, the standard reclamation COAs (Appendix A) would also be attached to APDs to require seeding with an appropriate native seed mix and monitoring of results.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new surface impacts that could lead to the development of invasive non-native plants.

Native American Religious Concerns

Affected Environment

The Proposed Action is located within an area identified by the Ute Tribes as part of their ancestral homeland. Five Class III cultural resource inventories (see section on Cultural Resources) were conducted in the Proposed Action's vicinity to determine if any areas were known to be culturally sensitive to Native Americans. No sensitive areas were identified or are currently known in the proposed project area.

Environmental Consequences

Proposed Action

At present, no Native American concerns are known within the project area and none were identified during the inventories. The Ute Tribe of the Uintah and Ouray Bands, one of the primary Native American tribes in this area of the CRVFO, have indicated that they do not wish to be consulted for small projects or projects where no Native American areas of concern have been identified either through survey or past consultations. Therefore, formal consultation with Native American Tribes was not undertaken for the current project.

If new data regarding cultural resources are identified or disclosed, new terms and conditions may have to be negotiated to accommodate their concerns.

Although the Proposed Action would have no direct impacts, increased access and personnel in the vicinity of the proposed project could indirectly impact unknown Native American resources ranging from illegal collection to vandalism.

The National Historic Preservation Act (NHPA) requires that if newly discovered cultural resources are identified during project implementation, work in that area must stop and the agency Authorized Officer notified immediately (36 CFR 800.13). The Native American Graves Protection and Repatriation Act (NAGPRA), requires that if inadvertent discovery of Native American Remains or Objects occurs, activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice made to the agency Authorized Officer, as well as the appropriate Native American group(s) (IV.C.2). Notice may be followed by a 30-day delay (NAGPRA Section 3(d)).

Further actions also require compliance under the provisions of NHPA and the Archaeological Resource Protection Act. WPX Energy Rocky Mountain LLC will notify its staff and contractors of the requirement under the NHPA, that work must cease if cultural resources are found during project operations. A standard Education/Discovery COA for the protection of Native American values would be attached to the APDs (Appendix A). The importance of these COAs would be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered. The proponent and contractors would also be made aware of requirements under the NAGPRA.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts on cultural resources.

Noise

Affected Environment

The Proposed Action would lie within a rural setting approximately 2.6 miles southwest of Parachute, Colorado and near I-70. The project area is rural, and noise levels are presently created by traffic on I-70 and the frontage roads and by oil and gas development activities.

Noise is generally described as unwanted sound, weighted and noise intensity (or loudness) is measured as sound pressure in decibels (dBAs). The decibel scale is logarithmic, not linear, because the range of sound that can be detected by the human ear is so great that it is convenient to compress the scale to encompass all the sounds that need to be measured. Each 20-unit increase in the decibel scale increases the sound loudness by a factor of 10.

Sound levels have been calculated for areas that exhibit typical land uses and population densities. In rural recreational areas, ambient sound levels are expected to be approximately 30 to 40 dBA (USEPA 1974, Harris 1991). As a basis for comparison, the noise level during normal conversation of two people 5 feet apart is 60 dBA.

Environmental Consequences

Proposed Action

The project would result in increased levels of noise during the construction, drilling, and completion phases. The noise would be most noticeable along the roads used to haul equipment and at the pad location. Drilling activities are subject to noise abatement procedures as defined in the COGCC Rules and Regulations (Aesthetic & Noise Control Regulations). Operations involving pipeline or gas facility installation or maintenance, the use of a drilling rig, completion rig, workover rig, or stimulation are subject to the maximum permissible noise levels for industrial zones. The 2006 revised COGCC noise control rules call for noise levels from oil and gas operations at any well site and/or gas facility to comply with the maximum permissible levels at a distance of 350 feet (Table 6).

Table 6. Noise Standards for Light industrial, Residential/Agriculture/Rural		
<i>Zone</i>	<i>7:00 A.M. to 7:00 P.M</i>	<i>7:00 P.M. to 7:00 A.M</i>
Light Industrial	70 dBA	65 dBA
Residential/Agricultural/Rural	55 dBA	50 dBA

Given the remote locations of the proposed project activities, with no reasonably close occupied structure or designated recreational area, the light industrial standard is applicable. The allowable noise level for periodic impulsive or shrill noises is reduced by 5 dBA from the levels shown (COGCC 2008). Short-term (7- to 14-day) increases in nearby noise levels would characterize road and well pad construction while the existing cuttings pit is re-opened. Based on the Inverse Square Law of Noise Propagation (Harris 1991) and an typical

noise level for construction sites of 65 dBA at 500 feet (Table 7), project-related noise levels would be approximately 59 dBA at a distance of 1,000 feet, approximating active commercial areas (USEPA 1974).

<i>Equipment</i>	<i>Noise Level (dBA)</i>		
	<i>50 feet</i>	<i>500 feet</i>	<i>1,000 feet</i>
Air Compressor, Concrete Pump	82	62	56
Backhoe	85	65	59
Bulldozer	89	69	63
Crane	88	68	62
Front End Loader	83	63	57
Heavy Truck	88	68	62
Motor Grader	85	65	59
Road Scraper	87	67	61
Tractor, Vibrator/Roller	80	60	54

Sources: BLM (1999a), La Plata County (2002)

Traffic noise would also be elevated as a consequence of the Proposed Action. The greatest increase would be along access roads during the drilling and completion phases. Based on the La Plata County data presented in Table 7 approximately 68 dBA of noise (at 500 feet) would be created by each fuel and water truck that travels these roads. Less noise would be created by smaller trucks and passenger vehicles such as pickup trucks and sport utility vehicles. Although the duration of increased noise from this source would be short, it would occur repeatedly during the drilling and completion phases.

Noise impacts would decrease during the production phase but would remain background noise levels. During maintenance and well workover operations, noise levels would temporarily increase above those associated with routine well production.

These increased noise levels would be in addition to levels of noise that are already above background levels due to the proximity of I70 and current oil and gas developments in the area. While exposure to these noise levels is unlikely to be harmful, it may be annoying to residents.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new surface impacts or developments that could lead to a change in noise levels.

Socioeconomics

Affected Environment

The project area is located entirely within Garfield County, Colorado, with a total county land area of 2,958 square miles (Garfield County 2013a). The county seat is Glenwood Springs; other towns include Carbondale, New Castle, Silt, Rifle, Battlement Mesa, and Parachute. Interstate 70 transects the county east to west with a network of county and private roads servicing the project area.

The population of the county grew by an average of approximately 2.5% per year from 2000 to 2011 but decreased by 2.6% from 2008 to 2011 due to the national economic downturn, resulting in a net increase of 27% from 44,259 to 56,270 residents (CDOLA 2013a). Population growth in Garfield County is expected to nearly double to 109,887 in 2040 (CDOLA 2012). In July 2011, the Garfield County population was 70% urban and 30% rural, with a population density of approximately 19 people per square mile (City Data 2012).

In February 2013, the total estimated civilian labor force was 34,107 with an unemployment rate of 7.8% (CDLE 2013). In the fourth quarter of 2011, the industry groups with the highest percentage of total employment were construction (14.4%), retail trade (13.7%), and Health Care and Social Assistance (13.5%). Table 8 lists the top 10 industries in Garfield County for the fourth quarter of 2011 (CDLE 2013).

Table 8 Selected Industry Sectors for Garfield County		
<i>Rank</i>	<i>Job Sector</i>	<i>Employees</i>
1	Construction (buildings and engineered projects)	2,901
2	Retail Trade	2,782
3	Health Care and Social Assistance	2,732
4	Education Services	2,484
5	Accommodation and Food Services	2,464
6	Mineral Extraction (including mining and oil and gas)	2,426
7	Public Administration	1,717
8	Professional, Scientific & Technical Services	1,047
9	Administration, Support, Waste Management, and Remediation	874
10	Transportation and Warehousing	782

Personal income in Garfield County has also risen, growing approximately 6% per year from \$1.3 billion in 2000 to \$2.1 billion in 2011. However, personal income dropped by nearly 10% from 2008 to 2011. Annual per capita income has grown in the same period approximately 3% per year, from \$29,081 to \$37,858, but annual per capita income dropped by nearly 11% from 2008 to 2011 (USDOD 2012).

The communities of Parachute, Rifle, Silt, and New Castle are considered to have the most affordable housing, while the communities of Glenwood Springs and Carbondale have the least affordable housing. In March 2012 the cost of living index in Garfield County was 88.6 (less than the U.S. average of 100) (City Data 2012).

Activities on public land in the vicinity of the project area are primarily ranching/farming, hunting, OHV travel, and the development of oil and gas resources. Hunters contribute to the economy because many require lodging, restaurants, sporting goods, guides and outfitting services, food, fuel, and other associated supplies.

Production of natural gas in Garfield County increased dramatically during recent years, from approximately 70 billion cubic feet (BCF) in 2000 to 700 BCF in 2012 (COGCC 2013a). Approximately 1,286 drilling permits were approved in Garfield County between April 2, 2012 and March 29, 2013 (COGCC 2013b). However, U.S. natural gas prices have dropped in recent years from \$10.79 per thousand cubic feet (MCF) in July 2008 to \$1.89/MCF in April 2012 (USDOE 2013). The U.S. price of natural gas has begun to improve, in December 2012 it was \$3.35/MCF, but has not reached the prices of 2008. Natural gas development activity in Garfield County remains low.

Property tax revenue from oil and gas development is a source of public revenue in Garfield County. In 2012, oil and gas assessed valuation in Garfield County was approximately \$2.8 billion, or about 73% of total property tax assessed value distribution (Garfield County 2013b). The county's largest taxpayers are in the oil and gas industry (Garfield County 2013c).

The Federal government makes Payments in Lieu of Taxes (PILT) to local governments to help offset losses in property taxes due to nontaxable Federal lands within their boundaries (USDI NBC 2013). The PILT distributions are based on acres for all Federal land management agencies. Approximately 60% of all Garfield County lands are Federally owned (Garfield County 2013a). The amount may also be adjusted based on population and as apportioned by Congress. By formula, payments are decreased as other Federal funds, such as mineral royalty payments, increase. PILT amounts to Garfield County over the last five years ranged from \$1,732, 974 in 2008 to \$403,176 in 2012 (USDI NBC 2013).

In addition to PILT distributions, Federal mineral royalties are levied on oil and gas production from Federal mineral leases. Oil and gas lessees pay royalties equal to 12.5% of the wellhead value of oil and gas produced from public land (BLM 2007a). Half the royalty receipts received from production are distributed to the state and county governments, which are then allocated to fund county services, schools, and local communities.

The NEPA process requires a review of the environmental justice issues as established by Executive Order 12898 (February 11, 1994). The order established that each Federal agency identify any "disproportionately high and adverse human health or environment effects of its programs, policies, and activities on minority and low-income populations." The Hispanic/Latino community is the only minority population of note in the project vicinity. In 2010, approximately 28% of the residents of Garfield County identified themselves as Hispanic/Latino, compared to 17% in 2000 (CDOLA 2013b). Statewide, the population of Hispanic/Latino residents grew 41.2% during the same 10-year period (CDOLA 2013c). African-American, American Indian, Asian, and Pacific Islander residents accounted for a combined 1.6% of the Garfield County population in 2010, compared to a statewide level of 7% (CDOLA 2013b).

Environmental Consequences

Proposed Action

The Proposed Action would have minor positive impacts on the local economy of Garfield County through the creation of additional job opportunities in the oil and gas industry and in supporting trades and services. In addition, Garfield County would receive additional tax and royalty revenues. The Proposed Action could result in negative social impacts including changing the character of the area, reducing scenic quality, increasing dust levels especially during construction, and increasing traffic.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new socioeconomic impacts, positive or negative.

Soils (includes an analysis of Public Land Health Standard 1)

Affected Environment

According to the *Soil Survey of Rifle Area, Colorado* (USDA 1985), the majority of the GM 32-4 pad expansion and road realignment would occur on the Torriorthents-Rock outcrop complex with the proposed gas pipeline upgrade and very eastern edge of the GM 32-4 pad expansion occurring on the Nihill channery loam.

Most of the GM 32-4 well pad expansion and GR 21-4 road realignment work would be located on the Torriorthents-Rock outcrop complex. This complex consists of exposed bedrock, loose stones, shallow soils over bedrock, and stony basaltic alluvium. These soils and rock outcrops are moderately steep to very steep and have slopes ranging from 15 to 70 percent. Primary uses for these soils are grazing, wildlife habitat, and recreation.

The new 12-inch gas gathering pipeline upgrades would occur on Nihill channery loam soil. This deep, well-drained soil is found on alluvial fans, and sides of valleys at elevations from 5,000 to 6,500 feet and slopes of 6% to 25%. This soil is formed in alluvium derived from Green River shale and sandstone. Surface runoff is moderately rapid, and erosion hazard is severe. Primary uses for this soil is grazing and wildlife habitat.

Environmental Consequences

The Proposed Action would result in approximately 4.98 acres of new surface disturbance and 3.29 acres of existing surface disturbance for a total short-term disturbance of 8.27 acres. The total surface disturbance would be reduced to 1.93 acres after interim reclamation. Of the 8.27 acres of short-term disturbance, 6.29 acres would occur on BLM land. All of the 1.93 acres of long-term disturbance would occur on BLM land. The pad was shaped and positioned in the optimal location to take advantage of the topography and avoid disturbances to the drainages and steep slopes. The area generally contains adequate vegetation buffers that would minimize the potential for sediment transport to Riley Gulch, Parachute Creek, and the Colorado River. However, construction activities would cause slight increases in local soil loss, loss of soil productivity, and sediment available for transport to surface waters. Potential for such soil loss and transport would increase as a function of slope, feature (pad, road, or pipeline route) to be constructed, and proximity to drainages.

The proposed pad, access road, cuttings area, frac pads and pipelines would be located on areas with moderate to severe risk of erosion due to the soil characteristics and its location and an alluvial fan. Particular care would be taken during construction and reclamation to ensure that proper design and BMPs, including the COAs listed in Appendix A, are utilized to prevent erosion and slope movement.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to soil resources.

Analysis on Public Land Health Standard 1 for Upland Soils

The Rifle-West Watershed LHA conducted in 2005 determined that all areas were meeting Standard 1 for upland soils, although some areas were found to be impacted by accelerated erosion. The Proposed Action with associated mitigation is unlikely to prevent Standard 1 from being achieved. Measures attached as COAs (Appendix A) for controlling erosion and revegetating disturbances would minimize long-term impacts

to soil volume and productivity. The No Action Alternative would have no bearing on the ability of the area to meet the public land health standard for soils because no new development would occur on BLM land.

Special Status Species (includes an analysis on Public Land Health Standard 4)

Federally Listed, Proposed, or Candidate Plant Species

Affected Environment

According to the latest species list from the USFWS, four Federally listed plant species may occur within or be impacted by actions occurring in Garfield County. Table 9 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action.

Table 9. Potential for Occurrence of Threatened or Endangered Plant Species				
<i>Species and Status</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
Parachute penstemon (<i>Penstemon debilis</i>) -- Threatened	Sparsely vegetated, south-facing, steep, white shale talus of the Parachute Creek Member of the Green River Formation; 8,000 to 9,000 feet	Other oil shale endemic species, such as Roan Cliffs blazing-star, Cathedral Bluffs meadow-rue, dragon milkvetch, Piceance bladderpod, and oil shale fescue	No	No
DeBeque phacelia (<i>Phacelia submutica</i>) – Threatened	Sparsely vegetated, steep slopes in chocolate-brown, gray, or red clay on Atwell Gulch and Shire Members, Wasatch Formation; 4,700 to 6,200 feet	Desert shrubland with four wing saltbush, shadscale, greasewood, broom snakeweed, bottlebrush squirreltail and Indian ricegrass, grading upward into scattered junipers	Yes	Yes
Colorado hookless cactus (<i>Sclerocactus glaucus</i>) – Threatened	Rocky hills, mesa slopes, and alluvial benches in salt desert shrub communities; often with well-formed microbiotic crusts; can occur in dense cheatgrass 4,500 to 6000 feet	Desert shrubland with shadscale, galleta grass, black sagebrush, Indian ricegrass grading upward into big sagebrush and sagebrush/pinyon-juniper	Yes	No
Ute lady’s-tresses orchid (<i>Spiranthes diluvialis</i>) – Threatened	Subirrigated alluvial soils along streams and in open meadows in floodplains; 4,500 to 7,200 feet	Box-elders, cottonwoods, willows, scouring rushes, and riparian grasses, sedges, and forbs	Yes	No

Three Federally listed plant species have the potential to occur within or adjacent to the project area. These are DeBeque phacelia, Colorado hookless cactus, and Ute lady’s tresses. Rare plant surveys were conducted within the proposed project area in April 2013, and in May and June 2012 in association with the overlapping GM 41-4 pad and Riley Gulch water tie-in projects. Suitable habitat was found for DeBeque phacelia and Colorado hookless cactus in the project vicinity, but no plants were found. Because no DeBeque phacelia plants were found in known occurrence sites of similar elevation in 2013, and because 2012 was a very poor year for this annual species, presence or absence could not be determined within suitable habitat at this site.

Therefore, for purposes of this analysis DeBeque phacelia is assumed to be present within the two mapped suitable habitat sites located within 100 meters (328 feet) of the proposed road re-route to the GR 21-4 well pad. Marginally suitable habitat for Ute lady's tresses was found along portions of Riley Gulch. However, indications of intermittent water flow and high soil pH suggest that this habitat is unlikely to support Ute lady's tresses.

Environmental Consequences

Proposed Action

DeBeque Phacelia

The Proposed Action would have no impacts to DeBeque phacelia. However, two areas of suitable DeBeque phacelia habitat are present at distances of 53 meters (174 feet) and 94 meters (308 feet) from the edge of disturbance for the GR 21-4 access road realignment. DeBeque phacelia plants in these areas could potentially experience indirect impacts the proposed project. Because surveys could not be performed during a year of good DeBeque phacelia germination at similar elevations, suitable habitat is assumed to be occupied for purposes of this analysis

Indirect impacts to DeBeque phacelia would include increased dust levels associated with the proposed project. Dust can impact plants by clogging stomatal openings in their leaves, impeding gas exchange and reducing the ability of plants to take in carbon dioxide. Dust on leaf surfaces can also effectively reduce light availability to photosynthetic tissues. Light and carbon dioxide are both critical for plants to conduct photosynthesis, and reductions in either can reduce the quantity of carbohydrates plants can produce through photosynthesis, and thereby reduce plant growth and seed production. Increased dust levels could also have negative impacts on pollinators, thereby reducing pollination and seed production in cactus plants. Dust levels could be expected to increase above ambient levels during road and pad construction. Since DeBeque phacelia is an annual species, its survival as a species is entirely dependent on its ability to produce seeds with each generation of plants. Accumulation of dust on plant leaves could therefore impact DeBeque phacelia populations over time by reducing seed production. Dust levels could be expected to increase above ambient levels in the short term from road construction, and in the long term from vehicle traffic associated with well operation.

DeBeque phacelia is also a species which does not compete well with other plants for resources such as water and soil nutrients. It typically grows where few or no other plants grow, and populations have been known to disappear as other plant species increase in density. The relatively barren, high clay content soils are particularly vulnerable to some species of noxious weeds and other nonnative species, including cheatgrass, Russian-thistle, and bur buttercup. Because cheatgrass and other invasive plant species are present within the project area, they have the potential to increase in conjunction with increased ground disturbance from project implementation. Herbicides commonly used to treat weeds on well pads kill most broadleaf plants, and would likely also kill DeBeque phacelia plants. Herbicide effects on DeBeque phacelia seeds have not been tested and are unknown.

Potential indirect effects to DeBeque phacelia would be of greatest concern during the time period when plants are present aboveground. To mitigate these potential negative effects, COAs would place limitations on the time of year when construction could occur, require dust management and restrictions on substances used to control dust, require noxious weed treatment, and restrict herbicide use.

Colorado Hookless Cactus

Although suitable habitat is present, no Colorado hookless plants were found during extensive surveys in 2012 and 2013, in or adjacent to the project area. Therefore, the project would have no impacts on this species.

Parachute Penstemon

Parachute penstemon requires a substrate of Green River shale for its habitat, and no Green River shale is present in the project vicinity. Because no suitable habitat is present, the project would have no impacts on this species.

Ute Lady's-tresses Orchid

Surveys were conducted outside of the appropriate survey season for Ute lady's-tresses, which blooms and is identifiable from late July through August. Marginally suitable habitat for Ute lady's tresses is present intermittently along Riley Gulch near the project area. Perennial springs exist in the upper reaches of Riley Gulch, but their flows do not appear to continue perennially in the project area. Since Ute lady's-tresses requires subirrigated habitats, it appears unlikely that the marginal habitat in Riley Gulch is adequate to support this species. Soils in Riley Gulch are also alkaline and may be too high in pH to support this species. Therefore, it is highly unlikely that Ute lady's-tresses orchids are present near the project area. However, mitigation measures to protect the riparian habitat in Riley Gulch would be included in the COAs (Appendix A). With implementation of these measures, impacts on this species are not anticipated.

Determinations of Effect

Because suitable habitat for DeBeque phacelia is present within 100 meters of the proposed road re-route to GR 21-4, the effects determination for the Proposed Action on DeBeque phacelia is "**May Affect, Not Likely to Adversely Affect.**" Because no occurrences of Colorado hookless cactus are known within 100 meters of any proposed ground-disturbing activity, the effects determination for the Colorado hookless cactus is "**No Effect.**" Because no suitable habitat is present for Parachute penstemon within 100 meters of any proposed ground-disturbing activity, the effects determination for Parachute penstemon is "**No Effect.**" Because no known occurrences of Ute lady's-tresses, and only marginally suitable to unsuitable habitat for this species, are present within 100 meters of any proposed ground-disturbing activity, the effects determination for the Ute lady's-tresses is "**No Effect.**"

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to threatened or endangered species.

BLM Sensitive Plant Species

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 10, along with summaries of their habitat requirements, potential for occurrence within the project area, and potential to be impacted by the Proposed Action.

Table 10. Potential for Occurrence of BLM Sensitive Plant Species

<i>Species and Status</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
DeBeque milkvetch (<i>Astragalus debequaeus</i>)	Varicolored, fine-textured, seleniferous or saline soils of Wasatch Formation; 5,100 to 6,400 feet	Pinyon-juniper woodlands and desert shrub.	Yes	No
Naturita milkvetch (<i>Astragalus naturitensis</i>)	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	Yes	No
Piceance bladderpod (<i>Lesquerella parviflora</i>)	Shale outcrops of the Green River Formation, on ledges and slopes of canyons in open areas; 6,200 to 8,600 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No
Roan Cliffs blazing-star (<i>Mentzelia rhizomata</i>)	Steep, eroding talus slopes of shale, Green River Formation; 5,800 to 9,000 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No
Harrington's penstemon (<i>Penstemon harringtonii</i>)	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200 to 9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	No	No
Cathedral Bluffs meadow-rue (<i>Thalictrum heliophilum</i>)	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300 to 8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

Species with the potential to occur within the project area are DeBeque milkvetch and Naturita milkvetch. Rare plant surveys were conducted within the proposed project area in 2012 in association with the GM 41-4 and Riley Gulch water tie-in projects, and new surveys for the GM 32-4 project were conducted in April 2013. No occurrences of any BLM sensitive plant species were found within the project area.

Environmental Consequences

Proposed Action

Because no known BLM sensitive plants are known or expected to occur within or adjacent to the project area, the Proposed Action would have no adverse impacts on any BLM sensitive plant species.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to BLM sensitive plants.

Federally Listed, Proposed, or Candidate Animal Species

Affected Environment

Federally listed, proposed, or candidate species potentially occurring within or affected by actions in Garfield County include eight species of vertebrate wildlife. Table 11 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action. Species indicated as potentially affected are described in more detail following the table.

Table 11. Potential for Occurrence of Threatened or Endangered Animal Species				
<i>Species and Status</i>	<i>Distribution in Region</i>	<i>Preferred Habitats</i>	<i>Potentially Present in Vicinity?</i>	<i>Potentially Adversely Affected?</i>
Canada lynx (<i>Lynx canadensis</i>) – Threatened	Dispersed use in in upper montane and subalpine zones of Colorado mountains.	Subalpine spruce-fir forests; also lodgepole pine and aspen to as low as upper montane.	No	No
Yellow-billed cuckoo (<i>Coccyzus americanus</i>) –Candidate	Major rivers and tributaries of western, northwestern, and south-central Colorado.	Large cottonwood stands with tall shrub understory along rivers.	No	No
Mexican spotted owl (<i>Strix occidentalis lucida</i>) – Threatened	No historic occurrence in area; present in southwestern Colorado and southern Front Range.	Rocky cliffs in canyons with closed-canopy coniferous forests.	No	No
Razorback sucker (<i>Xyrauchen texanus</i>) – Endangered	Colorado River and major tributary rivers, including mainstem Colorado River upstream to town of Rifle in CRVFO.	General: Deep, slow runs, pools, and eddies. Spawning: silt to gravel substrates in shallow water and seasonally flooded overbank areas.	Yes	Yes
Colorado pikeminnow (<i>Ptychocheilus lucius</i>) – Endangered			Yes	Yes
Humpback chub (<i>Gila cypha</i>) -- Endangered	Mainstem Colorado River and major tributaries – upstream to Black Rocks near Utah state line.	Rocky runs, riffles, and rapids in swift, deep rivers.	No	Yes
Bonytail chub (<i>Gila elegans</i>) – Endangered			No	Yes
*Lineage GB cutthroat trout (<i>Oncorhynchus clarki</i> ssp.) – Threatened	Identified in 60 streams in Colorado River basin including CRVFO area.	Clean, cool headwaters streams and ponds isolated from other strains of cutthroat trout.	No	No
*Lineage GB = Relict populations of cutthroat trout indigenous to the Colorado/Gunnison/Dolores River drainages. Currently protected under the ESA pursuant to prior listing of the greenback cutthroat trout (<i>O. c. stomias</i>) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.				

Environmental Consequences

Proposed Action

Razorback Sucker, Colorado Pikeminnow, Humpback Chub, and Bonytail Chub. Federally listed as endangered. These four species of Federally listed big-river fishes occur within the Colorado River drainage basin near or downstream from the project area. Designated Critical Habitat for the razorback sucker and Colorado pikeminnow includes the Colorado River and its 100-year floodplain west (downstream) from the town of Rifle. This portion of the Colorado River lies a few miles northeast of the project area. The nearest known habitat for the humpback chub and bonytail is within the Colorado River approximately 70 miles downstream from the project area. Occasionally, the bonytail is in Colorado west of Grand Junction, but its range does not extend east from that point. Only one population of humpback chub, at Black Rocks west of Grand Junction, is known to exist in Colorado.

The Canada lynx, Greater sage-grouse, Mexican spotted owl, and western yellow-billed cuckoo are not expected to occur in the project vicinity based on documented occurrences and habitat types present. Therefore, the Proposed Action would have “**No Effect**” on these species.

The endangered Colorado River fishes could potentially be affected by the consumptive use of water taken from the Colorado River basin to support activities associated with the Proposed Action. Depletions in flows in the Colorado River and major tributaries are a major source of impacts to these fishes due to changes in the flow regime that reduce the availability and suitability of spawning sites and habitats needed for survival and growth of the larvae. Principal sources of depletion in the Colorado River basin include withdrawals for agricultural or industrial uses, withdrawals for municipal water supplies, and evaporative losses from reservoirs. On average, approximately 0.77 acre-feet of Colorado River water is consumed during activities related to each oil and gas well. This is equivalent to 0.04 to approximately 0.04 cubic feet per second (cfs) of water throughout the typical 10-day drilling period for an oil and gas well in the CRVFO area.

In 2008, the BLM prepared a Programmatic Biological Assessment (PBA) addressing water-depleting activities associated with BLM’s fluid minerals program in the Colorado River Basin in Colorado. In response to this PBA, the USFWS issued a Programmatic Biological Opinion (PBO) (ES/GJ-6-CO-08-F-0006) on December 19, 2008. The PBO concurred with BLM’s effects determination of “**May Affect, Likely to Adversely Affect**” relative to the Colorado pikeminnow, humpback chub, bonytail chub, or razorback sucker as a result of depletions associated with oil and gas projects. To offset the impacts, the BLM has set up a Recovery Agreement, which includes a one-time fee per well. The estimated depletions from the Proposed Action would be added to the CRVFO tracking log and submitted to the USFWS per the PBA/PBO at the end of the year to account for depletions associated with BLM’s fluid mineral program. The calculated mitigation fees are used by the USFWS for mitigation projects and contribute to the recovery of these endangered species through restoration of habitat, propagation, and genetics management, instream flow identification and protection, program management, non-native fish management, research and monitoring, and public education.

Other potential impacts to these species include inflow of sediments from areas of surface disturbance and inflow of chemical pollutants related to oil and gas activities. Construction activities would increase the potential for soil erosion and sedimentation. Although a minor temporary increase in sediment transport to the Colorado River may occur, it is unlikely that the increase would be detectable above current background levels. In any case, the Federally listed, proposed, or candidate fish species associated the Colorado River are adapted to naturally high sediment loads and would not be affected.

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations are sufficient to cause acute effects. The potential for adverse impacts would be limited to the Colorado pikeminnow and razorback sucker, the two species known to occur within the CRVFO area. Spills or other releases of chemical pollutants as a result of oil and gas activities are infrequent in the CRVFO area due to the various design requirements imposed by BLM and the State of Colorado. In the event of a spill or accidental release into an ephemeral drainage that could flow to the Colorado River, the operator would be required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by BLM or the State. For these reasons, and because any spills into the Colorado River would be rapidly diluted to levels below that are not deleterious, or even detectable, the potential for adverse impacts from chemical releases is not considered significant.

Based on the above, the BLM has determined that inflow of sediments and chemicals into the Colorado River would have “**No Effect**” on the endangered big river fishes. In the unlikely event of a spill with the potential to affect, or documented occurrence of an effect, the USFWS would initiate discussions with the involved parties to identify appropriate remedies.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to sensitive species.

BLM Sensitive Animal Species

Affected Environment

Table 12 lists BLM sensitive vertebrate wildlife species that are known to occur in the region and, if present, could potentially be adversely affected by the Proposed Action. Potential impacts to species indicated as present or possible in the area of potential direct or indirect effects are discussed following the table.

Table 12. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Fringed myotis (<i>Myotis thysanodes</i>) Townsend’s big-eared bat (<i>Corynorhinus townsendii</i>)	Roosting: Caves, trees, mines, and buildings. Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
<i>Northern goshawk</i> (<i>Accipiter gentilis</i>)	Montane and subalpine coniferous forests and aspen forests; may move to lower elevation pinyon/juniper woodland in search of prey during winter.	Possible in winter
<i>Bald eagle</i> (<i>Haliaeetus leucocephalus</i>)	Nesting/Roosting: Mature cottonwood forests along rivers. Foraging: Fish and waterfowl along rivers and lakes; may feed on carrion, rabbits, and other foods in winter.	Nests and roosts along Colorado River
Peregrine falcon (<i>Falco peregrinus</i>)	Nesting: Cliffs, usually near a river, large lake, or ocean. Foraging: Waterfowl on rivers and lakes; upland fowl in open grassland or steppe.	Nests on Roan Cliffs
Brewer’s sparrow (<i>Spizella breweri</i>)	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Possible – habitat marginal

Table 12. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area

<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Midget faded rattlesnake (<i>Crotalus oreganus concolor</i>)	Cold desert of NW Colorado, SW Wyoming, and NE Utah, primarily in sagebrush with rock outcrops and exposed canyon walls.	Possible – habitat marginal
Great Basin spadefoot (<i>Spea intermontana</i>)	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	No suitable habitat
Northern leopard frog (<i>Lithobates pipiens</i>)	Clean, perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Possible
Bluehead sucker (<i>Catostomus latipinnis</i>)	Primarily smaller streams with a rock substrate and mid to fast-moving waters; also shallows of larger rivers.	Present in Parachute Creek
Flannelmouth sucker (<i>Catostomus discobolus</i>)	Runs, riffles, eddies, and backwaters in large rivers.	
Roundtail chub (<i>Gila robusta</i>)	Slow-moving waters adjacent to fast waters in large rivers.	
“Lineage CR” cutthroat trout (<i>Oncorhynchus clarki</i> ssp.)	Headwaters streams and ponds with cool, clear waters isolated from populations of non-native cutthroats and rainbow trout.	
*Lineage CR = Relict populations of cutthroat trout indigenous to the Yampa/Green River drainages but widely transplanted throughout the state. Managed as a BLM sensitive species pursuant to prior designation of the Colorado River cutthroat trout (<i>O. c. pleuriticus</i>) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.		

Environmental Consequences

Proposed Action

Fringed Myotis and Townsend’s Big-eared Bat. No caves or other suitable roosting sites occur in the project area. Loss of large trees, potentially also used for roosting, would be negligible. Loss of habitat above which the bats could search for aerial prey would also be minimal, and disturbance due to construction activities would not occur at night when the bats are feeding.

Northern Goshawk. Although this large accipiter (“bird hawk”) nests in upper montane or subalpine conifer or aspen forests, individual often move into lower elevation pinyon-juniper habitats in winter in search of small birds and diurnal small mammals. This winter use is transitory and dispersed, with the goshawks foraging across large areas instead of establishing winter territories. Consequently, human activities that may cause displacement are unlikely to affect the winter survival of individuals and would not affect populations.

Bald Eagle. Although bald eagles nest and roost along the Colorado River just southeast of the project area, the potential for use of the actual project area is moderate. Any such use would most likely be by an individual hunting across large expanses of open upland habitats during winter. The project area would represent a small portion of such potential winter hunting habitat, and the reclaimed grass-forb community would provide better habitat for prey than the current shrubland types.

Peregrine Falcon. Peregrine falcons nest along cliff bands south and north of the project and hunt for waterfowl along the Colorado River or other birds across open terrain. Use of the project area is unlikely, except for infrequent, transitory overflights while traveling between the Colorado River and the cliff bands to the south.

Brewer's Sparrow. Although the habitat is marginal in the project area, the possibility exists of nesting by this species. The 60-day TL to prohibit removal of vegetation during the period May 1 to July 1 (see Appendix A) would avoid or minimize the potential for impacts to nesting Brewer's sparrows. Construction activities outside this period could cause individuals to avoid the disturbance while feeding. However, this impact would be limited in duration at any point along the corridor, and individuals are expected to feed across very large home ranges outside the nesting season, thus minimizing the severity of this potential indirect impact.

Midget Faded Rattlesnake. This small viper is considered a small, pale-colored subspecies of the common and widespread western rattlesnake, although some authorities consider it and another western subspecies, the Great Basin rattlesnake (*C. o. nuntius*) to be genetically distinct species. Although movement patterns of midget faded rattlesnakes are not well known, they are believed to be limited to a few hundred meters from den sites. The limited distribution and small home range make this snake susceptible to impacts from human disturbance (USGS 2007). Threats include direct mortality from vehicles traveling on roads and pads, off-highway vehicle use throughout the landscape, capture by collectors, and livestock grazing. As access increases into previously undeveloped areas, the risk of encounters with humans would increase, resulting in some cases of mortality or collection.

Flannelmouth Sucker and Roundtail Chub. As with the ecologically similar Colorado River endangered fishes described above, the flannelmouth sucker and roundtail chub are adapted to naturally high sediment loads and therefore would not be affected by increased sediment transport to Parachute Creek and the Colorado River. Furthermore, protective COAs for water quality would minimize this potential (Appendix A). However, these species are vulnerable to alterations in flow regimes in the Colorado River (including evaporative losses from dams and depletions from withdrawal of water for irrigation or municipal water supplies) that affect the presence of sandbars and seasonally flooded overbank areas needed for reproduction. The amount of depletion in flows associated with this project is not expected to have a significant adverse impact on the survival or reproductive success of these species.

Colorado River Cutthroat Trout – Lineage CR. This genetically distinct lineage of cutthroat, native to the Yampa/Green River basin, is known to have been transplanted into other drainages, including Parachute Creek upstream of the project area, where its presence has been confirmed by BLM electrofishing surveys. Although not indigenous to the mainstem Colorado River basin, this lineage is treated by BLM Colorado as a sensitive (species). Protective COAs for water quality would minimize the potential for increased sediment transport to creeks (Appendix A). However, this trout recreationally important sportfish is vulnerable to alterations in flow regimes (including evaporative losses from dams and depletions from withdrawal of water for irrigation or municipal water supplies) that affect the presence of sandbars and seasonally flooded overbank areas needed for reproduction. The amount of depletion in flows associated with this project is not expected to have a significant adverse impact on the survival or reproductive success of this species.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to sensitive species.

Analysis on Public Land Health Standard 4 for Special Status Species

Based on the Health Assessment Report, Rifle-West Watershed (2005) and species status updates which have occurred since 2005, three Federally listed plant species and three BLM sensitive plant species are known to occur within this this watershed area. The Federally listed plant species are Colorado hookless cactus,

Parachute penstemon, and DeBeque phacelia, and the BLM sensitive plant species are DeBeque milkvetch, Harrington's penstemon, and Roan Cliffs blazingstar. As of 2005, Standard 4 was being met for these species. However, continued oil and gas development was noted as a risk factor for reduction of potential habitat and habitat quality for special status plant species. There are no known occurrences of any special status plant species with the proposed project area, and potentially suitable habitat is minimal. The Proposed Action would create new ground disturbance, increase the risk of noxious weeds, and potentially impact marginally suitable habitat for special status plant species. This could contribute to the movement away from meeting Standard 4 for special status plants.

According to a recent land health assessment, habitat conditions within this area appear suitable for special status animal species known or likely to occur (BLM 2005). However, large portions of the landscape are being fragmented due to extensive natural gas development. Continued habitat fragmentation is of concern as large blocks of contiguous intact habitat are required by many species. Sustained development and the proliferation of roads, well pads, pipelines, compressor stations, tank farms and other surface facilities will continue to reduce habitat patch size and affect both habitat quality and quantity. The potential to impact some species would increase as development continues. The Proposed Action in conjunction with similar activities throughout this watershed would increase fragmentation and could increase sediment loads. Although the contribution of the Proposed Action is in itself small, it may further trend the area away from meeting Standard 4 for special status wildlife.

The No Action Alternative would not result in a failure of the area to achieve Standard 4 because the proposed developments on BLM land would not occur.

Vegetation (includes an analysis on Public Land Health Standard 3)

Affected Environment

The project area lies primarily within pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) habitat at the upper elevations, and sagebrush shrub habitat at the lower elevations, although these two habitat types intergrade with each other. Some mountain shrub zone species are also present in moister areas near Riley Gulch, and some desert scrub species are present at the lower elevations. Project site elevations range from 5,365 to 5,600 feet. The topography includes deeply incised drainages and increasingly steep ridges and drainage walls moving upwards towards the Mount Callahan ridges. The dramatic topography and varied soils create a variety of microhabitats for a diversity of plant species. Patches of bare ground are also common, and occur naturally due to the soils, topography, and climate.

Common shrub species, in alphabetical order of scientific name, include black sagebrush (*Artemisia nova*), broom snakeweed (*Gutierrezia sarothrae*), fourwing saltbush (*Atriplex canescens*), greasewood (*Sarcobatus vermiculatus*), Mormon-tea (*Ephedra viridis*), siltbush (*Zuckia brandegei*), rabbitbrush (*Ericameria nauseosa*), shadscale (*Atriplex confertifolia*), and Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Common forbs include Patterson's milkvetch (*Astragalus pattersonii*), arrowleaf balsamroot (*Balsamorhiza sagittata*), wavyleaf thistle (*Cirsium undulatum*), springparsley (*Cymopterus* sp.), claret cup cactus (*Echinocereus triglochidiatus*), gumweed (*Grindelia fastigiata*), mountain peppergrass (*Lepidium montanum*), tansy-aster (*Machaeranthera* sp.), evening-primrose (*Oenothera* sp.), prickly-pear cactus (*Opuntia* sp.), Osterhout's penstemon (*Penstemon osterhoutii*), cushion phlox (*Phlox hoodii*), longleaf phlox (*Phlox longifolia*), sharpleaf twinpod (*Physaria acutifolia*), twistflower (*Streptanthus cordatus*), poison-aster (*Xylorhiza venusta*), and Harriman's yucca (*Yucca harrimaniae*). Common grasses include Indian ricegrass (*Achnatherum hymenoides*), bottlebrush squirreltail (*Elymus elymoides*), slender wheatgrass (*Elymus trachycaulus*), Salina wild rye (*Leymus salinus*), galleta grass (*Pleuraphis jamesii*), and muttongrass (*Poa fendleriana*).

Vegetation in disturbed areas around the existing well pad and along roads includes several non-native species such as cheatgrass, crested wheatgrass, curvseed butterwort, salsify, and yellow sweetclover.

Narrow riparian areas along Riley Gulch include narrowleaf cottonwood (*Populus angustifolia*), coyote willow (*Salix exigua*), and knotted rush (*Juncus nodosus*) intergrading with sagebrush, rabbitbrush, and other upland species. These moister areas also contain species typically found at higher elevations, such as Gambel oak (*Quercus gambelii*), Utah serviceberry (*Amelanchier utahensis*), skunkbrush sumac (*Rhus trilobata*), snowberry (*Symphoricarpos albus*), and Woods' rose (*Rosa woodsii*).

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 4.98 acres of new disturbance would occur in pinyon-juniper and sagebrush habitats, of which 4.23 acres would be on BLM land and 0.75 acres would be on private land. Following construction and well completion, interim reclamation would occur on all areas not needed for ongoing operations. A total of 1.93 acres of this new disturbance would remain as long-term disturbance, in addition to 3.29 acres of existing disturbance. Temporary reclamation on BLM land would consist of seeding with native plant species in accordance with the reclamation COAs presented in Appendix A, and using species mixes appropriate for pinyon-juniper and sagebrush plant communities. The composition of plant species used for reclamation on private lands would be at the discretion of the landowner.

Adjacent native vegetation would not be directly impacted, but could be indirectly impacted by increased dust deposition on leaves. Dust levels could be expected to increase above ambient levels in the short term from pad expansion, well drilling, new road construction, and new pipeline installation. Increased dust levels can negatively impact plants by clogging stomatal openings in the leaves, impeding gas exchange and reducing the ability of plants to take in carbon dioxide. Dust on the leaf surface can also effectively reduce light availability at the leaf surface. Light and carbon dioxide are both critical for plants to conduct photosynthesis, and reductions in either can reduce the quantity of carbohydrates plants can produce through photosynthesis, and thereby reduce plant growth and seed production. Dust on leaf surfaces can also facilitate plant tissue uptake of toxic pollutants (Thompson et al. 1984, Farmer 1993, Sharifi et al. 1997). Dust can also affect snowmelt patterns and resulting hydrology and soil moisture availability, alter soil pH and nutrient availability, and result in plant community composition changes (Angold 1997, Auerbach et al. 1997, Field et al. 2010, Gieselman 2010, Johnston and Johnston 2004).

Cumulative impacts from the proposed project development and plant habitat loss, in combination with previous oil and gas development in this area, could also indirectly impact adjacent vegetation through negative effects on pollinators. Pollinators depend on both appropriate floral communities and on appropriate nesting habitat. Many pollinators show fidelity to specific habitat areas, and if these sites become isolated from contiguous habitat by disturbances such as roads, pollinators may be reluctant to cross these barriers to utilize other habitats (Osborne and Williams 2001, Bhattacharya et al. 2002). Roads and well pad construction can negatively impact pollinators by creating barriers, by removing habitat as a result of new construction, and by direct mortality through collisions with vehicles.

Additional indirect impacts to adjacent vegetation could occur from noxious weeds and other non-native plants associated with project area disturbances. The proposed removal of native vegetation would increase the site vulnerability to invasion and establishment of noxious weeds and other non-native invasive plant species, particularly with the existing widespread establishment of noxious weeds and other non-native species. Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native species. Ground disturbance combined with vehicle traffic and construction equipment provides

both excellent habitat and vectors for invasive species, particularly when these species are already present within the soil seed bank (Schmidt 1989, Parendes and Jones 2000, Gelbard and Belnap 2003, Larson 2003, Zaenepoel et. al. 2006). These non-native species can negatively impact native plant communities, both directly through competition for resources, and indirectly through alteration of soil microbial communities (Klironomos 2002, Hierro et. al. 2006, Reinhart and Callaway 2006, Vogelsang and Bever 2009). Herbicide treatments of noxious weeds can also result in negative effects or mortality to native plants if they are co-occurring or located nearby (BLM 2007b). Implementation of standard COAs for noxious weeds and temporary reclamation (Appendix A) would reduce the risk of noxious weed and invasive species establishment and spread through the combination of chemically treating noxious weeds while also re-introducing native vegetation through seeding of native plant species.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to vegetation.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also Wildlife, Aquatic and Wildlife, Terrestrial)

Based on the Rifle West Land Health Assessment (2005), different portions of this area were meeting the standard, marginally meeting the standard, or not meeting the standard. Problems noted included widespread cheatgrass dominance, particularly at lower elevations and on south-facing slopes, with a corresponding loss of perennial grasses and forbs. Also noted was dominance of sagebrush communities by old shrubs with poor seedling recruitment. Noxious weeds are present at varying levels throughout the assessment area. Appendix A includes provisions to revegetate the disturbances with native species and to control noxious weeds. If successfully revegetated, the Proposed Action should not contribute to the failure of the area to meet Standard 3. The No Action Alternative would have no bearing on the ability of the area to meet the public land health standard for plant and animal communities because no new development would occur on BLM land.

Visual Resources

The Proposed Action would occur on private land and BLM land approximately 6.3 miles northwest of Parachute. The BLM land is classified as visual resource management (VRM) Class II as identified by the 1984 Glenwood Springs Resource Management Plan (Figure 5). The objectives for VRM Class II, as defined by the BLM's Manual H-8410-1 – Visual Resource Inventory (BLM 1986), is described below.

- The objective of VRM Class II is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

The Proposed Action located on BLM land is within Visual Resource Inventory Class II, Scenic Quality B, Sensitivity High, and within the Foreground/Middle Ground Distance Zone. The Proposed Action located on private land, VRM objectives do not apply, and visual values for those lands are protected by land owner discretion. The BLM can only make recommendations to mitigate impacts to scenic values.

The proposed GM 32-4 well pad, the GR 21-4 well pad access road, and the GR 21-4 4-inch buried water pipeline are located entirely on BLM land. The proposed two 10-inch surface water pipelines and 12-inch buried gas pipeline are located on BLM and private land.

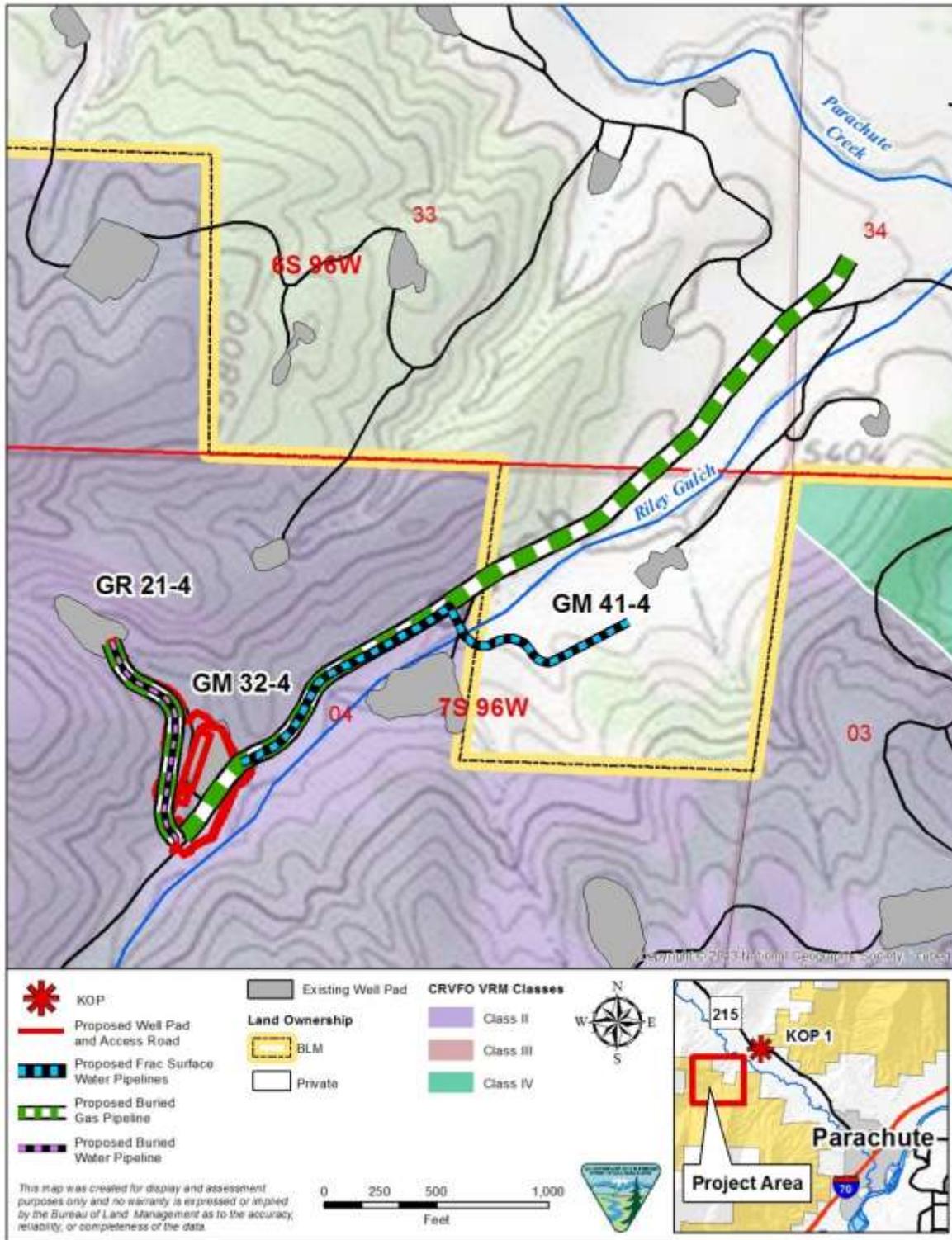


Figure 5. Proposed Action Relationship to VRM Class Designations and Land Ownership.

The project area consists of finger-like ridges extending north from Mount Callahan. The ridges are dissected by steep drainages that terminate at Parachute Creek to the northeast. The Proposed Action would occur within one of these steep drainages, known as Riley Gulch. The area is characteristic predominantly of oil and gas development. Vegetation consists of pinyon-juniper woodlands along the slopes and ridgelines and sagebrush shrublands in the lower open areas with tan and coral/salmon-colored soils.

The visual resource analysis area includes CR215 (Parachute Creek Road). The typical casual observer in the area would include people who live, work, and travel through the area. Although the Proposed Action would occur predominantly on BLM land, with no public access, the area has high visual sensitivity and is less than 2 miles from CR215. BLM guidance states that lands with high visual sensitivity are those within 5 miles of a primary travel corridor and of moderate to very high visual exposure, where details of vegetation and landform are readily discernible and changes in visual contrast are easily noticed by the casual observer. The visual impact analysis for this project is based on the view from one key observation point, KOP 1 (Figure 6), located along CR215 directly across from Riley Gulch. KOP 1 represents the linear viewing location and angle/direction with the most frequent viewers and is typical of the view by a casual observer while traveling north or south along CR215. However, the viewer would have a small viewing window of the Proposed Action because of the nature of the topography that immediately surrounds the Proposed Action location, angle of view, and travel speeds. Two ridges along the Riley Gulch drainage and rolling foothills at the mouth of the drainage enclose the Proposed Action to the north and to the south. The ridgelines and rolling foothills provide visual screening into the project location from farther south and north of KOP 1.

Environmental Consequences

Proposed Action

The proposed expansion of the existing GM 32-4 well pad and realignment of the GR 21-4 access road would create visual contrast within the immediate landscape, but less so from KOP 1, by removing existing vegetation, exposing bare ground, and creating a series of distinct lines and colors in the landscape. Such visual changes would be the most evident during construction and completion activities. Once the well pad is put into production and the pad is recontoured and vegetation is reestablished, the overall visual contrast and texture of the site would be expected to blend with the surroundings. Short-term visual impacts would include the presence of drilling rigs, heavy equipment (e.g. dozers, graders, etc.) and vehicular traffic with an associated increase in dust, light pollution, and well flaring.

The GM 32-4 well pad design was originally designed to have a 1:1 (horizontal to vertical) cut slope between the well pad and GR 21-4 access road. However, the well pad and road design have been redesigned to create a 1.5:1 cut slope, although less than ideal for soil stability it would be an improvement. The production facilities would be located along the south and southwest side of the well pad (away from the steep cut-slope), which should maximize the ability to recontour the cut-slope to a more suitable slope (e.g. 2:1 or 3:1) during interim reclamation and for vegetation establishment. The well pad would be constructed with a maximum 26.2-foot cut slope in the northwest corner of the well pad and a maximum 7.9-foot fill slope in the northeast corner. The drill cuttings would be stored along the west side of the well pad. The total short-term surface disturbance for the Proposed Action on BLM land would amount to 6.29 acres. Following drilling and completion operations, the total disturbed area on BLM land would be reduced to 1.93 acres after interim reclamation. The Proposed Action would be visible but would not attract attention because of its inaccessibility and limited viewing window because of the surrounding topography, angle of view, and travel speeds. To meet VRM Class II objectives, mitigation requirements are applied as COAs (Appendix A).

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 well pad would not be drilled and 6.29 acres of associated surface disturbance on BLM land would not occur. The result would be no new impacts to visual resources.

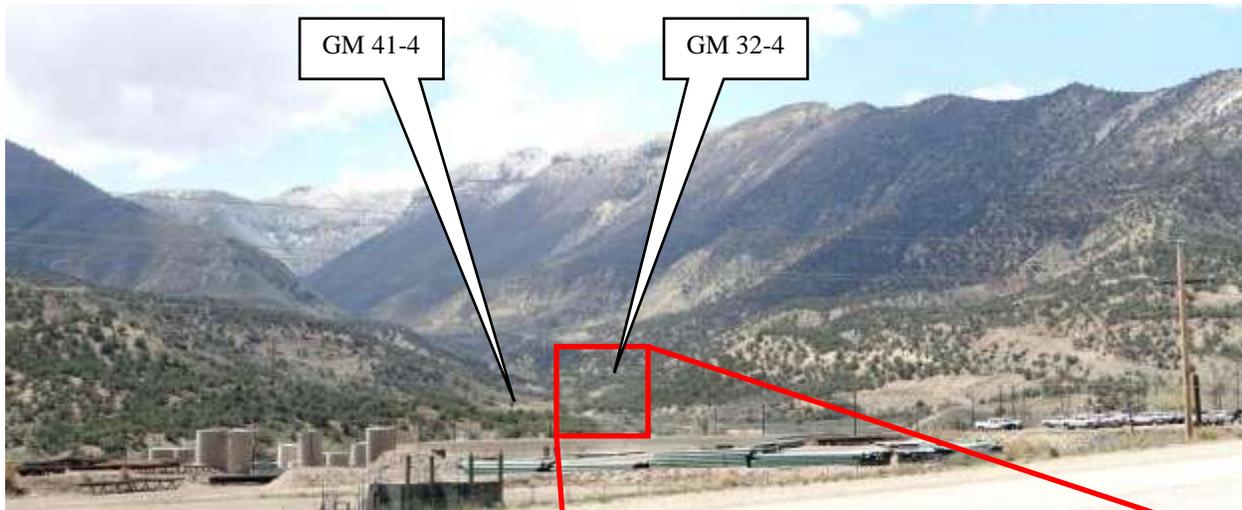


Figure 6. KOP 1 – View southwest from CR215. The viewer would be slightly lower or equal to the Proposed Action from this location. Riley Gulch is the most visible from this location. However, detailed views into Riley Gulch are obscured by the development that has occurred in the immediate foreground. Views into Riley Gulch also become screened by the surrounding topography as you move further north or south on CR215. The open area created by the existing GM 32-4 well pad, well pad cut-slope, and GR 21-4 access road would become slightly larger than as seen in KOP 1. Some of the trees above and to the left of the well pad cut-slope would be removed to accommodate the new GR 21-4 road alignment.



Existing cut-slope with existing GR 21-4 access road above.

Wastes – Hazardous or Solid

Affected Environment

The affected environment for hazardous materials includes air, water, soil, and biological resources that may potentially be affected by an accidental release of hazardous materials during transportation to and from the project area, storage, and use in construction and operations. Sensitive areas for hazardous materials releases include areas adjacent to waterbodies, above aquifers, and areas where humans or wildlife would be directly impacted.

BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all National Environmental Policy Act documents list and describe any hazardous and/or extremely hazardous materials that would be produced, used, stored, transported, or disposed of as a result of a proposed project. The Glenwood Springs Resource Area, Oil & Gas Leasing & Development, Draft Supplemental Environmental Impact Statement (June 1998), Appendix L, Hazardous Substance Management Plan, contains a comprehensive list of materials that are commonly used for oil and gas projects. It also includes a description of the common industry practices for use of these materials and disposal of the waste products. These practices are dictated by various Federal and State laws and regulations, and the BLM standard lease terms and stipulations that would accompany any authorization resulting from this analysis. The most pertinent of the Federal laws dealing with hazardous materials are as follows:

- The Oil Pollution Act (Public Law 101-380, August 18, 1990) prohibits discharge of pollutants into Waters of the U.S., which by definition would include any tributary, including any dry wash that eventually connects with the Colorado River.
- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510 of 1980) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment. It also provides national, regional, and local contingency plans. Applicable emergency operations plans in place include the National Contingency Plan (40 CFR 300, required by section 105 of CERCLA), the Region VIII Regional Contingency Plan, the Colorado River Sub-Area Contingency Plan (these three are Environmental Protection Agency produced plans), the Mesa County Emergency Operations Plan (developed by the Mesa County Office of Emergency Management), and the BLM Grand Junction Field Office Hazardous Materials Contingency Plan.
- The Resource Conservation and Recovery Act (RCRA) (Public Law 94-580, October 21, 1976) regulates the use of hazardous substances and disposal of hazardous wastes. Note: While oil and gas lessees are exempt from RCRA, right-of-way holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

Emergency response to hazardous materials or petroleum products on BLM lands are handled through the BLM Grand Junction Field Office contingency plan. BLM would have access to regional resources if justified by the nature of an incident.

Environmental Consequences

Proposed Action

Possible pollutants that could be released during the construction phase of this project would include diesel fuel, hydraulic fluid, and lubricants. These materials would be used during construction of the pads, roads, and pipelines, and for refueling and maintaining equipment and vehicles. Potentially harmful substances used

in the construction and operation phases would be kept onsite in limited quantities and trucked to and from the site as required. No hazardous substance, as defined by 40 CFR 355 would be used, produced, stored, transported, or disposed of in amounts above threshold quantities. Waste generated by construction activities would not be exempt from hazardous waste regulations under the oil and gas exploration and production exemption of RCRA. Exempt wastes include those associated with well production and transmission of natural gas through the gathering lines and the natural gas itself.

With the exception of produced hydrocarbons, ethylene glycol (antifreeze), lubricants, and amine compounds, chemicals subject to reporting under Title III of the Superfund Amendments and Reauthorization Act in quantities of 10,000 pounds or more would not be used, produced, stored, transported, or disposed of during construction or operation of the facilities. None of the chemicals that would be used in construction meet the criteria for an acutely hazardous material/substance, or meet the quantities criteria per BLM Instruction Memorandum No. 93-344. In addition, no extremely hazardous substance, as defined in 40 CFR 355, in amounts above threshold planning quantities would be produced, used, stored, transported, or disposed of during construction or operation of the facilities.

Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a larger extent, during drilling and completion operations since the workforce would increase during those activities. Trailers housing workers would be outfitted with self-contained sewage collection system; regular trash collection would occur throughout the drilling and well completion process.

Surface water or groundwater could be affected under the Proposed Action. Pollutants that might be released during the operational phase of the project could include condensate, produced water (if the wells in the area produce water) and glycol (carried to the site and used as antifreeze). While uncommon, an accident could occur that could result in a release of any of these materials. A release could result in contamination of surface water or soil. Improper casing and cementing procedures could result in the contamination of groundwater resources. In the case of any release, emergency or otherwise, the responsible party would be liable for cleanup and any damages. Depending on the scope of the accident, any of the above referenced contingency plans would be activated to provide emergency response. At a minimum, the BLM Grand Junction Field Office contingency plan would apply.

These laws, regulations, standard lease stipulations, and contingency plans and emergency response resources are expected to adequately mitigate any potential hazardous or solid waste issues associated with the Proposed Action.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts from waste, hazardous or solid.

Water Quality – Surface and Ground (includes an analysis on Public Land Health Standard 5)

Surface Water

Affected Environment

The project lies approximately 5.5 miles northwest of Parachute, Colorado in the lower reaches of Riley Gulch, an ephemeral drainage. The ephemeral drainages and Riley Gulch in the vicinity of the project flow east and approximately half a mile to Parachute Creek and on to the Colorado River, approximately 3 miles to

the southeast. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007) the mainstem Parachute Creek, including all tributaries and wetlands, from confluence of the west and east forks to the confluence with the Colorado River are within segment 11h. The following is a brief description of segments 11h.

- Segment 11h – This segment has been classified aquatic life cold 2, recreation P, and agriculture. Aquatic life cold 2 indicates that this water course is not capable of sustaining a wide variety of cold or warm water biota due to habitat, flows, or uncorrectable water quality conditions. Recreation class P refers to waters that have the potential to be used for primary contact recreation. This segment is suitable or intended to become suitable for agricultural purposes that include irrigation and livestock use.

All streams within segment 4h are not on the State of Colorado’s 303(d) List of Impaired Waters and Monitoring and Evaluation List (CDPHE, WQCC Regulation No. 93) (CDPHE 2010). The Colorado River which Parachute Creek flows to is currently considered impaired due to naturally high levels of selenium. Colorado’s Monitoring and Evaluation List identifies waterbodies where there is reason to suspect water quality problems, but uncertainty also exists regarding one or more factors. No stream segments on Riley Gulch or Parachute Creek are on the State of Colorado’s Monitoring and Evaluation List (CDPHE 2010).

Sediment is a pollutant of concern for the Colorado River Basin (CDPHE, WQCC Regulation No. 94). The closest downstream sediment measuring station on the Colorado River is USGS station 9093700 near De Beque, Colorado. For the period of 1974 to 1976 the mean sediment yield was 1,818 tons per day and varied between 8 and 41,300 tons per day. The median value for the same period was 267 tons/day (USGS 2007).

At this time, minimal water quality data are available for Riley Gulch near the GM 32-4 pad site. A water sample collected from Riley Gulch by BLM personnel on April 16, 2004, had a temperature of 21° C (69.8° F), a conductivity of 1,372 microsiemens per centimeter (uS/cm), and a pH of 8.7. Data have been collected on Parachute Creek to which Riley Gulch drains and presented in Table 13.

<i>Parameter</i>	<i>Parachute Creek near Parachute, CO USGS Site #09093000</i>	
	<i>7/29/1981</i>	<i>5/09/1980</i>
Instantaneous discharge (cfs)	4.4	420
Temperature, water (°C)	12.5	
Field pH (standard units)	9.2	8.3
Specific conductance (µS/cm/cm at 25°C)	913	460
Total Dissolved Solids (mg/L)	576	400
Hardness as CaCO ₃ (mg/L)	340	200
Chloride (mg/L)	22	4.6
Selenium (µg/L)	2	1
Dissolved oxygen (mg/L)	7.8	10
NA = data not available Source: USGS 2007		

Environmental Consequences

Proposed Action

The planned pad expansion would involve the rerouting of an ephemeral drainage that flows across the pad footprint into Riley Gulch. The drainage would be routed around the western edge of the pad using earthen berms and a lined channel constructed to accommodate the expected flows. The new drainage interface with Riley Gulch would feature a rock-lined channel and structures to achieve the necessary drop in elevation to the existing channel (Figures 4a and 4b).

Potential impacts to surface water associated with the Proposed Action include increased erosion and sedimentation of streams, changes in channel morphology due to road and pipeline crossings, and contamination by drilling fluids, produced water, or condensate. Surface waters would be most susceptible to sedimentation during construction, drilling, and completion activities. After this period, reclamation activities would substantially reduce surface exposure, decreasing the risk to surface waters over the long-term. In addition, the rerouting of the drainage could cause long-range sediment transport if not installed and maintained properly.

Although surface waters would be most susceptible to sedimentation over the short-term, access roads and the diversion ditches would remain in place over the life of the well (i.e., 20 to 30 years) and would channel runoff during periods of precipitation. Sedimentation and stream channel impacts associated with roads would be reduced through the implementation of Best Management Practices (BMPs) and other preventative measures. As proposed, these measures would include limiting cut slope steepness, step-cutting, limiting road grade to 10%, crowning road surfaces, installing culverts and drainage systems, and applying gravel to all new or upgraded BLM roads in the project area to a compacted thickness of 6 inches (Appendix A).

Other elements of the Proposed Action are designed to mitigate risks to surface waters associated with the release of drilling fluids, produced water, and condensate. A closed-loop drilling system would be implemented which recycles drilling fluids; cuttings would be dried through the use of a shaker system and be stacked in a cuttings trench. A traditional reserve pit would not be constructed.

Tanks used to store produced water and condensate would be placed in secondary containment to prevent offsite release. In the event of an accidental release, produced water and condensate would be confined for cleanup in a containment area and would not migrate to surrounding soils or surface waters. Pipelines associated with the transport of these liquids would be pressure tested to detect leakage prior to use. Cuttings must be decontaminated to COGCC standards prior to pit closure; the table of applicable standards can be found at http://cogcc.state.co.us/RR_docs_new/rules/900Series.pdf

Oil and gas waste management practices have the potential to contaminate soils and surface water. Contamination of soils could cause long-term reduction in site productivity resulting in increased erosion and potential sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater. Elements of the Proposed Action are designed to mitigate risks to surface waters associated with the release and migration of drilling fluids, produced water, and condensate. A closed-loop drilling system would be implemented which recycles drilling fluids; cuttings would be dried through the use of a shaker system, decontaminated to COGCC standards and be stacked against the cutslope on the pad. A traditional reserve pit would not be constructed. Completions may be conducted either onsite or remotely and fluids may be stored in surface containment or a pit.

In addition to individual containment measures, the entire pad would be bermed to contain an accidental release on the pad. In the event of an accidental release, produced water and condensate would be confined for cleanup in a containment area and would not migrate to surrounding soils or surface waters. Pipelines associated with the transport of these liquids would be pressure tested to detect leakage prior to use. Implementation of the standard COAs for mitigating impacts to surface waters (Appendix A) would minimize risks of adverse impacts associated with construction and ongoing production activities.

Refer to Appendix A for standard Conditions of Approval that would mitigate impacts to surface water. Through the use of COAs and BMPs associated with construction activities, prompt interim reclamation, and the implementation of the preventative measures associated with the treatment of fluids, impacts to surface waters would be minimized and should be minor.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to surface water.

Waters of the U.S.

Affected Environment

Waters of the U.S. located in the project vicinity include Cottonwood Gulch and unnamed ephemeral tributaries to the Colorado River. Section 404 of the Clean Water Act requires a Department of the Army permit from the U.S. Army Corps of Engineers (USACE) prior to discharging dredged or fill material into waters of the U.S. as defined by 33 CFR Part 328.

Environmental Consequences

Proposed Action

Impacts to waters of the U.S., the rerouting of the drainages and any upgrades to the road and pipeline crossings of drainages within the project would be authorized by the USACE. A COA listed in Appendix A required that the operator obtain a formal jurisdictional determination by USACE prior to any construction that could affect waters of the U.S. and verification that the impacts do not require a permit.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to waters of the U.S.

Groundwater

Affected Environment

The Lower Piceance Basin contains both alluvial and bedrock aquifers (Colorado Geological Survey 2003). Unconsolidated alluvial aquifers are the most productive aquifers in the region (USEPA 2004) and are defined as narrow, thin deposits of sand and gravel formed primarily along stream courses, in this case, along the Colorado River and its tributaries. Alluvial well depths are generally less than 200 feet and water levels

typically range between 100 to 150 feet. Well yield is dependent upon the intended use of the well, well construction design, sediment type and saturated thickness. Domestic use wells are limited to 15 gallons per minute (gpm) administratively, while municipal wells are designed and constructed for maximum potential yield.

The principal bedrock aquifers of the Piceance Basin are the Uinta Formation and the Parachute Creek Member of the Green River Formation, and are defined as the upper and lower Piceance Basin aquifer systems. The Uinta Formation consists of discontinuous layers of sandstone, siltstone, and marlstone and is less permeable than the hydrologically connected upper Parachute Creek Member (Robson and Saulnier 1981). The uppermost Uinta Formation also contains a shallow, perched aquifer that is separate from the upper aquifer unit (Cole et al. 1995). The upper Piceance Basin aquifer is underlain by the Mahogany confining unit, and correlates with the Mahogany Zone, the principal oil shale unit of the Piceance Basin. The Mahogany Zone separates the upper aquifer from the lower. The lower aquifer consists of the fractured marlstone of the lower part of the Parachute Creek Member. The thickness of the upper and lower aquifer units average 700 and 900 feet, respectively (CGS 2003). Both upper and lower aquifer systems are found within the surrounding cliffs of the project area, but no water wells are completed within either the upper or lower bedrock aquifers units as described above. Beneath these two aquifer systems is a confining unit consisting of the Wasatch Formation and the lower two members of the overlying Green River Formation. Some fresh-water wells are completed in localized water-bearing intervals within this unit. Below the Wasatch Formation is the Cretaceous-aged Mesaverde aquifer. The depth to the top of this aquifer beneath the project area is more than 5,000 feet below ground surface (bgs), far too deep for economic development. The Mesaverde aquifer is of regional importance, but does not provide recharge into the fresh water system within the shallower groundwater system of the area.

Water quality of the upper Piceance Basin aquifer unit is relatively good, ranging in Total Dissolved Solid (TDS) levels from 500 to 1,000 milligrams per liter (mg/L). In the lower unit, TDS concentrations increase from 1,000 to 10,000 mg/L along basin flow paths. Waters with TDS values in excess of 1,000 mg/L are generally unsuitable for potable supply. Water suitable for drinking has a Federal secondary standard set at 500 mg/L or less (USEPA 2006). The quality of the water in the Mesaverde aquifer is highly variable, with concentrations of dissolved solids ranging from less than 1,000 mg/L in many of the basin-margin areas to more than 10,000 mg/L in the central part of the Piceance Basin (USEPA 2004). In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water sources contain relatively fresh water. However, water quality in the Piceance Basin is generally poor overall due to the presence of nahcolite deposits and salt beds throughout the basin. Only very shallow waters such as those from the surficial Wasatch Formation are used for drinking water (USEPA 2004).

According to the CDWR database, there is one monitoring well located within a 1-mile radius of the proposed well site. The well located approximately 0.75 mile west of the proposed well site, is listed as having a depth of 55 feet, and static water level of 37 feet below ground surface.

Environmental Consequences

Proposed Action

Potential impacts to groundwater resources from the proposed development would include contamination of the groundwater with produced water, drilling mud, and petroleum constituents. Hydraulic fracturing would be incorporated to create additional pathways to facilitate gas production. Agents called proppants” used to prop open the fractures are mixed with both fresh water and produced water. Typical proppants include sand, aluminum, glass, or plastic beads, with less than 1% of other compounds such as corrosion-, friction-, and

scale-inhibitors (EnerMax Inc. 2007). Fracing techniques are used to create secondary porosity fractures, held open by proppants, allowing the otherwise trapped gas to migrate up the borehole for production.

Hydraulic fracturing would be conducted at 5,000 feet or more bgs. Drilling scenarios are developed to prevent fluids and produced hydrocarbons from migrating upward into fresh water zones. Also see the discussion of hydraulic fracturing on groundwater resources in the section of this EA on Geology and Minerals. Geologic and engineering reviews are conducted to ensure that the cementing and casing programs are adequate to protect all downhole resources. With proper construction practices, drilling practices, and BMPs, no significant adverse impact to groundwater aquifers is anticipated to result from the project (see Downhole COAs in Appendix A).

Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

For decades, oil and gas companies and independent geophysicists have used state of the art equipment to monitor microseismic activity—defined as a “faint” or “very slight” tremor—during hydraulic fracturing to optimize well completions and to gather information about fracture dimensions and propagation (Warpinski 2009). These data give an indication about the magnitude of seismic activity associated with hydraulic fracturing, dimensions of resultant fractures in geologic formations, and probability for induced fractures to extend into nearby aquifers, if present. Research indicates that microseismic activity created by hydraulic fracturing occurs at Richter magnitude 1 or less (Warpinski and Zimmer 2012). In comparison, a magnitude 3 earthquake is the threshold that can be felt at the ground surface. The Richter magnitude scale is base-10 logarithmic, meaning that a magnitude 1 tremor is 1/100th the amplitude of a magnitude 3 tremor. The National Academy of Sciences reviewed more than 100,000 oil and gas wells and waste water disposal wells around the world and concluded that “incidences of felt induced seismicity appear to be very rare,” with only one such documented occurrence (NAS 2012).

The dimensions of induced fractures have been measured with field monitoring equipment (including microseismic “listeners”) and in laboratory tests and have been compared to three-dimensional (3D) hydraulic fracture models. Researchers have successfully validated these models for fracturing in “tight gas” reservoirs including those in the Piceance Basin. Results of the analyses show that fractures resulting from completions of oil and gas wells can be predicted (Zhai and Sharma 2005, Green et al. 2009, Palisch et al. 2012) and that the length of fractures in relation to depth of the well can be estimated.

Hydraulically induced fracture orientation in relation to the wellbore depends upon the downhole environment (i.e., rock mechanics, minimum and maximum principle stress directions, rock physical properties, etc.) and the wellbore trajectory. In vertical or normal directional wells such as in the Mesaverde formation—the predominant hydrocarbon-producing formation in the CRVFO area—fracture growth is primarily lateral or outward from the wellbore, with minimal secondary fractures extending at some angle away from the lateral fractures. In horizontal wells such as being used to develop deep marine shales, fracture growth from the wellbore is mainly determined by the orientation of the wellbore in relation to the principal stresses of the rock. Fracture growth toward the surface is limited by barriers such as variations in stress and lithology, as is also the case in vertical and normal directional wells. In some horizontal wells, fracture growth is similar to that in vertical or normal directional wells due to wellbore trajectory along the maximum principal stress direction. Analysis of data from thousands of wells indicates fracture extent (length) of less than 350 feet in the vast majority of cases, with outliers of 1,000 to 2,000 feet (Maxwell 2011, Davies et al. 2012). The extreme outlier lengths are associated with fractures in thick deposits of lithologically uniform marine shales.

The potential height of hydraulically induced fractures in horizontal drilling is reduced in layered sediments in which a propagating fracture encounters a change in rock type or a bedding plane within a formation or a

contact between formations. When these features are encountered, the fracture either terminates or to a lesser extent reorients along the generally horizontal bedding plane or formation contact instead of continuing upward across it. In the CRVFO area, natural gas production is primarily from vertically stacked, lenticular tight sands of the Mesaverde formation using vertical and directional wells. These tight-sand lenses are a few tens of feet thick or less. More recently, advances in horizontal drilling technology have allowed enhanced development of deeper marine shales such as the Niobrara formation. These tight-shale deposits are a few hundreds to thousands of feet thick in the CRVFO area compared to many hundreds or thousands of feet in some other gas-producing regions. The thickness of hydrocarbon-bearing strata in this area limits the vertical growth of primary and secondary fractures resulting from hydraulic stimulation.

Based on a review of available information on microseismic monitoring and fracture dimensions, Fisher and Warpinski (2011) concluded that fractures from deep horizontal wells are not a threat to propagate across the long distances (thousands of feet) needed to reach fresh-water aquifers much closer to the surface. This conclusion applies to the CRVFO area, and is also applicable to much shallower potable groundwater sources consisting of unconsolidated alluvium (streambed deposits) associated with the Colorado River and major tributaries. In general, alluvial water wells in the CRVFO extend to depths of less than 200 feet, with few in the range of 400 feet. Typical water levels in these wells range from 50 to 100 feet deep. Impacts to water quality of these shallow fresh-water wells is highly improbable as a result of hydraulic fracturing, which occurs at depths of 5,000 to 11,000 feet below ground surface.

In addition to vertical separation of several thousand feet between the upper extent of fractures and fresh-water aquifers are requirements by the BLM and COGCC for proper casing and cementing of wellbores to isolate the aquifers penetrated by a wellbore. BLM requires that surface casing be set from 800 to 1,500 feet deep, based on a geological review of the formations, aquifers, and groundwater. Cement is then pumped into the space between the casing and surrounding rock to prevent fluids from moving up the wellbore and casing annulus and coming in contact with shallow rock layers, including fresh-water aquifers. BLM petroleum engineers review well and cement design and final drilling and cementing logs to ensure that the cement has been properly placed. When penetration of groundwater and freshwater aquifers is anticipated, BLM inspectors may witness the cementing of surface casing and subsequent pressure testing to ensure that the annular space between the casing and borehole wall is properly sealed.

No single list of chemicals currently used in hydraulic fracturing exists for western Colorado, and the exact combinations and ratios used by operators are considered proprietary. However, the general types of compounds and relative amounts used are well known and relatively consistent (Table 14). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 14 may or may not be used, and the information is provided solely as general information. Although a variety of chemical additives are used in hydraulic fracturing—the examples in Table 14 being drawn from a total of 59 listed on the FracFocus website—the vast bulk of fluid injected into the formation during the process is water mixed with sand, representing 99.51% of the total by volume in the typical mixture shown in Table 14. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

Following completion of fracturing activities, the pressure differential between the formation—a result of several thousand feet of overlying bedrock—and the borehole that connects with the surface causes most of the injected fluids to flow toward the borehole and then upward to the surface along with the hydrocarbon fluids released from the formation. The composition of this mixture, called flowback water, gradually shifts over a period of several days to a few months as injected fluids that have not yet migrated back to the wellbore or reacted with the native rock are carried out of the formation.

Table 14. Constituents of Typical Hydraulic Fracturing Operation in Tight Gas Formations

<i>Additive Type*</i>	<i>Typical Example*</i>	<i>Percent by Volume**</i>	<i>Function*</i>	<i>Common Use of Example Compound</i>
Acid	Hydrochloric acid	0.123	Dissolves mineral cement in rocks and initiates cracks	Swimming pool chemical and cleaner
Biocide	Glutaraldehyde	0.001	Eliminates bacteria in the water that produce corrosive or poisonous by-products	Disinfectant; sterilizer for medical and dental equipment
Breaker	Ammonium persulfate	0.010	Allows delayed breakdown of the gel	Used in hair coloring, as a disinfectant, and in manufacture of household plastics
Clay stabilizer	Potassium chloride	0.060	Creates a brine carrier fluid that prohibits fluid interaction with formation clays	Used in low-sodium table salt substitutes, medicines, and IV fluids
Corrosion inhibitor	Formic acid	0.002	Prevents corrosion of the well casing	Used as preservative in livestock feed; used as lime remover in toilet bowl cleaners
Crosslinker	Borate salts	0.007	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps, and cosmetics
Friction reducer	Polyacrylamide	0.088	“Slicks” the water to minimize friction	Used as a flocculant in water treatment and manufacture of paper
Gelling agent	Guar gum	0.056	Thickens the water to help suspend the sand propping agent	Used as a thickener, binder, or stabilizer in foods
Iron control	Citric acid	0.004	Prevents precipitation of metal oxides	Used as flavoring agent or preservative in foods
Surfactant	Lauryl sulfate	0.085	Increases the viscosity of the fluid	Used in soaps, shampoos, detergents, and as foaming agents
pH adjusting agent	Sodium hydroxide, acetic acid	0.011	Adjusts pH of fluid to maintain the effectiveness of other components	Sodium hydroxide used in soaps, drain cleaners; acetic acid used as chemical reagent, main ingredient of vinegar
Scale inhibitor	Sodium polycarboxylate	0.043	Prevents scale deposits in the pipe	Used in dishwashing liquids and other cleaners
Winterizing agent	Ethanol, isopropyl alcohol, methanol	--	Added as necessary as stabilizer, drier, and anti-freezing agent	Various cosmetic, medicinal, and industrial uses
Total Additives		0.49		
Total Water and Sand		99.51		
*FracFocus Chemical Disclosure Registry, fracfocus.org/chemical-use/what-chemicals-are-used				
**USDOE 2009				

In 2011, the COGCC published an analysis of hydraulic fracturing technology use in the state and potential risks to human health and the environment. The introduction to that report included the following paragraph:

“Hydraulic fracturing has occurred in Colorado since 1947. Nearly all active wells in Colorado have been hydraulically fractured. The COGCC serves as first responder to incidents and complaints concerning oil and gas wells, including those related to hydraulic fracturing. To date, the COGCC has not verified any instances of groundwater contaminated by hydraulic fracturing.”

Based on the information summarized above, the CRVFO has concluded that properly implemented hydraulic fracturing of oil and gas wells drilled within its boundaries for the purpose of accessing Federal fluid minerals or for accessing private fluid minerals from BLM surface lands does not represent a significant adverse impact to human health and the environment.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and the installation of new buried pipelines would not be needed. The result would be no new impacts to ground water.

Analysis on Public Land Health Standard 5 for Water Quality

The Rifle-West LHA conducted in 2004-5 included the Riley Gulch drainage. The assessment indicated that road encroachment and improperly functioning culverts were causing increased sedimentation resulting in a failure to meet Standard 5 in the Riley Gulch drainage. The onsite review of this proposed project found the culverts were functioning. Furthermore, the road surfacing, road realignments, and pad reclamation plans along with their associated best management practices outlined in this EA would reduce erosion and sedimentation levels within the ephemeral drainages that are found within the project area.

The Proposed Action would unlikely prevent Standard 5 from being achieved because direct impact to ephemeral drainages and the limited riparian areas are being avoided. Waterbodies, riparian areas and erosive soils are protected by lease stipulations, COAs, and requirements set for permitting by the COGCC and USACE. Therefore, the Proposed Action is not expected to contribute to a failure of the area to meet standards.

The No Action Alternative would have no bearing on the ability of the area to meet the public land health standard for plant and animal communities because no new development would occur on BLM land.

Wildlife (includes an analysis on Public Land Health Standard 3)

AQUATIC ORGANISMS

Affected Environment

Parachute Creek, a perennial stream and tributary of the Colorado River, is located approximately 0.5 mile from the proposed pad. Fish surveys in the upper reaches of Parachute Creek conducted by CPW and BLM have documented a small population of Colorado River cutthroat trout, a native trout listed as sensitive by the BLM and discussed in the section on Special Status Species. The brown trout (*Salmo trutta*), a non-native sportfish widely stocked throughout the region, also inhabits the creek. This trout of eastern North America has been widely introduced in mountainous areas of Colorado because of its tolerance for slightly warmer waters than the cutthroat trout and its ability to reproduce successfully in streams with small flows.

Aquatic macroinvertebrates living in perennial streams such as Parachute Creek during a portion of their lifecycles include larvae of stoneflies (Plecoptera), mayflies (Ephemeroptera), and some caddisflies (Trichoptera) in fast-flowing reaches with rocky or detrital substrates. Both the aquatic larvae and winged adults of these insects are the primary prey for trout in Parachute Creek. Terrestrial invertebrates that land or fall onto the water surface or are carried into the stream in runoff from adjacent uplands provide a secondary prey base. Slow-flowing portions of Parachute Creek with fine substrates, aquatic macroinvertebrates are likely to support the larvae of certain true flies such as midges (Chironomidae) and mosquitoes (Cuculidae) as

well as some species of caddisflies. These species are able to tolerate relatively warm, turbid, and poorly oxygenated waters, and their more abbreviated larval stages allow them to reproduce in intermittent streams and in seasonally inundated overbank areas.

Environmental Consequences

Proposed Action

Implementation of the Proposed Action could result in increases in erosion and sedimentation into Riley Gulch, Parachute Creek, and eventually the Colorado River. Because the Proposed Action includes summer use of the project areas, it is likely that roads and pads would not be muddy for extended periods of time. Roads are generally drier and in better condition during the non-winter months and consequently are less prone to erosion. Vehicular use during muddy road conditions could contribute to increased erosion of sediments into nearby ephemeral washes and eventually the Colorado River. The potential increase of sedimentation into the Colorado River would probably be nominal given background sediment loads currently carried by the river. Sediment-intolerant aquatic wildlife could be negatively affected, as increased erosion potential would persist and impair water and habitat quality. Measures to minimize erosion and sedimentation of aquatic environments are included among the COAs (Appendix A).

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to aquatic wildlife.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also Vegetation and Wildlife, Terrestrial)

According to a recent land health assessment, habitat conditions within this area appear suitable for aquatic species known or likely to occur (BLM 2005). Sustained development and the proliferation of roads, well pads, pipelines, compressor stations, tank farms, and other surface facilities would continue to reduce habitat size and affect both habitat quality and quantity. The potential to impact some species would increase as development continues. Although the contribution of the Proposed Action is in itself small, it may further trend the area away from meeting Standard 3 for aquatic wildlife.

The No Action Alternative would not result in a failure of the area to achieve Standard 3 because the proposed developments would not occur.

MIGRATORY BIRDS

Affected Environment

The project area consists of Wyoming sagebrush and rubber rabbitbrush shrublands on the valley floor, rimmed with Utah juniper and scattered pinyon along nearby slopes and ridgelines. Associated species include mountain-mahogany (*Cercocarpus montanus*), serviceberry (*Amelanchier utahensis*), black sagebrush (*Artemisia nova*), and a variety of native grasses and forbs. A weedy non-native annual grass, cheatgrass, is scattered and widespread throughout the project area.

Species on the U.S. Fish and Wildlife Service (2008) list of Birds of Conservation Concern (BCC) for the project region include two species associated with pinyon-juniper woodlands, the pinyon jay (*Gymnorhinus*

cyanocephalus) and juniper titmouse (*Baeolophus griseus*). Another BCC species, Cassin's finch (*Haemorhous cassinii*), nests in higher elevation montane and subalpine conifer forests but commonly moves into pinyon-juniper woodlands following nesting and throughout winter. None of these species was observed during the most recent survey (WWE 2012). Other birds associated with this habitat type include the broad-tailed hummingbird (*Selasphorus platycercus*), black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), gray flycatcher (*Empidonax oberholseri*), Townsend's solitaire (*Myadestes townsendii*), American robin (*Turdus migratorius*), mountain bluebird (*Sialia sialis*), plumbeous vireo (*Vireo plumbeus*), blue-gray gnatcatcher (*Polioptila caerulea*), black-throated gray warbler (*Dendroica nigrescens*), chipping sparrow (*Spizella passerina*), lark sparrow (*Chondestes grammacus*), and lesser goldfinch (*Spinus psaltria*).

Areas of mountain shrubs such as mountain-mahogany and serviceberry, although limited, have the potential to attract additional non-BCC species such as the black-headed grosbeak (*Pheucticus melanocephalus*) and spotted towhee (*Pipilo maculata*).

Sagebrush habitats may support one BCC species associated almost entirely with sagebrush steppe, the Brewer's sparrow (*Spizella breweri*), as well as other migrants such as the western meadowlark (*Sturnella neglecta*) and vesper sparrow (*Pooecetes gramineus*). Based on the extent and quality of the sagebrush, the habitat is marginal for Brewer's sparrow and outside the normal range of the sage sparrow (*Amphispiza belli*), another obligate on sagebrush occurring in the Wyoming Basin of northwestern Colorado.

See the following subsection for a discussion of raptors, resident passerines, and upland fowl.

Environmental Consequences

Proposed Action

The Proposed Action would result in a loss of nesting, roosting, perching, and foraging habitat for migratory birds on disturbed areas and reduce habitat effectiveness adjacent to areas where disturbance-related effects could be expected. The expansion of the well pad and access road as well as construction of the frac pad would remove approximately 7.6 acres of pinyon-juniper woodlands and sagebrush vegetation that would result in reduced habitat patch size. These changes to the habitat could negatively affect bird species that require large expanses of intact habitat. Habitat fragmentation could result in increased competition, increased exposure to predators, and a higher likelihood of nest parasitism. It is also possible that individual nests could be destroyed if well pads, roads, and production facilities are constructed during the nesting season.

In addition to the physical loss of habitat and habitat fragmentation, it is possible that during construction activities, individual birds could be displaced to adjacent habitats due to noise and human presence. Effects of displacement could include increased risk of predation or failure to reproduce if adjacent habitat is at carrying capacity. Furthermore, impacts to birds at the species or local population level could include a change in abundance and composition as a result of cumulative habitat fragmentation from energy development in the larger area. Impacts to migratory bird species that nest in pinyon-juniper and sagebrush habitats can be minimized by avoiding surface-disturbing activities during the nesting season. take place outside the nesting season.

All migratory bird species are protected by the Migratory Bird Treaty Act (MBTA), which makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition to the MBTA, Executive Order 13186 sets forth the responsibilities of Federal agencies to further implement the provisions of the MBTA by integrating

bird conservation principles and practices into agency activities and by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds. Consistent with Executive Order 13186 and BLM Colorado guidelines, CRVFO has established as a COA (Appendix A) a Timing Limitation (TL) prohibiting initiation of vegetation removal or ground-disturbing activities during the period **May 1 to July 1**, the peak period for incubation and brood rearing among migratory birds in the project vicinity. The BLM may grant an exception to this COA if surveys by a qualified biologist during the nesting season of BCC species potentially present indicates no active nests within 30 meters (100 feet) of the disturbance area.

Also for the protection of migratory birds is a COA specifying that any pits containing fluids must be fitted with one or more devices to avoid or minimize exposure to the fluids by migratory birds (Appendix A). Such exposures could result in acute toxicity or compromised insulation or buoyancy due to dissolution of protective oil on the feathers.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to migratory birds.

OTHER TERRESTRIAL SPECIES

Affected Environment

The project area would be located in medium density pinyon-juniper woodlands with openings of sagebrush, saltbush, and greasewood. Understory vegetation consists of mostly native grasses and forbs with some cheatgrass. Given these vegetation types, the area provides cover, forage, breeding, and nesting habitat for a variety of big game and small game species as well as nongame mammals, birds, and reptiles.

MAMMALS

The project area is within overall ranges of mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus nelsonii*). Because of its low elevation the project area is primarily winter range which means deer and elk populations increase during the winter months when animals migrate to lower elevations from the Battlements to the south. Winter densities of big game animals in a given area are dependent on the type of habitat present and the severity of the winter. Deeper snows and colder temperatures result in increase in the number of big game animals using the area.

The project area contains winter range and severe winter range for mule deer (*Odocoileus hemionus*) and a smaller amount of winter range for Rocky Mountain elk (*Cervus elaphus nelsoni*) as mapped by the Colorado Parks and Wildlife (CPW) (CPW 2011). The mule deer is a recreationally important species that are common throughout suitable habitats in the region. Although most of the area is mapped as mule deer winter range, the project area also receives use by deer during the summer. Rocky Mountain elk are also recreationally important, but the project area contains relatively little suitable habitat for this species. Most winter use by elk north of I-70 in the project vicinity is along Parachute Creek and tributary canyons or along Piceance Creek, which the elk access by moving northward from summer range on the Roan Plateau.

Large carnivores potentially present in the project vicinity include the mountain lion (*Felis concolor*), which moves seasonally with its preferred prey, the mule deer, and the black bear (*Ursus americanus*). Black bears are uncommon in the lowlands north of I-70 due to the scarcity of sufficient forest cover and suitable foods (including acorns and berries). Two smaller carnivores, the coyote (*Canis latrans*) and bobcat (*Lynx rufus*),

are also present throughout the region in open habitats and broken or wooded terrain, respectively, where they hunt for small mammals, reptiles, and ground-dwelling birds. Other small carnivores potentially present are the raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*) primarily along Parachute Creek and their close relatives the ringtail (*Bassariscus astutus*) and spotted skunk (*Spilogale gracilis*) the drier and more rugged terrain higher in Riley Gulch.

Small mammals present within the planning area include rodents such as the rock squirrel (*Otospermophilus variegatus*), golden-mantled ground squirrel (*Callospermophilus lateralis*), least chipmunk (*Tamias minimus*), and packrat (bushy-tailed woodrat) (*Neotoma cinerea*) and lagomorphs such as the desert cottontail (*Sylvilagus audubonii*) and black-tailed jackrabbit (*Lepus californicus*). Rodents and, to a lesser extent, lagomorphs are the primary prey base for a variety of avian and mammalian predators.

BIRDS

Raptors potentially nesting in the area include the red-tailed hawk (*Buteo jamaicensis*), Swainson's hawk (*B. swainsoni*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), American kestrel (*Falco sparverius*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*), the latter uncommonly. Two small owls potentially nesting in the area include a BCC species, the flammulated owl (*Otus flammeolus*), and a non-BCC species, the northern saw-whet owl (*Aegolius acadicus*). The latter was heard calling during biosurveys. Other raptors nesting in the vicinity and potentially visiting the project area during foraging include two BCC species, the golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus*), both potential transients from suitable nesting sites on cliffs and rocky bluffs throughout the area. The carrion-feeding turkey vulture (*Cathartes aura*) is also likely to search the area for food. Two BCC species that nest in the general project region but are not expected to forage within or near the site are the bald eagle and prairie falcon (see the section on Special Status Species).

A raptor survey completed in March 2012 identified a total of 11 nest structures within 0.25 mile of the pad and access road. Of these, one was believed to have been used by Cooper's hawks from 2007 through 2011 but was currently deteriorating, indicating disuse. Of the remaining 10 nests, all unoccupied and with the associated species unknown, three were reported as new nests in stable condition, two as previously identified nests in stable condition, and five as previously identified nests in unstable condition (WWE 2012). Upon checking the nests during the raptor nesting season in May 2013, none of the 11 nests showed evidence of occupancy.

Passerine (perching) birds commonly found in the area include year-round residents such as the common raven (*Corvus corax*), American crow (*C. brachyrhynchus*), black-billed magpie (*Pica hudsonia*), western scrub-jay (*Aphelocoma californica*), mountain chickadee (*Poecile gambeli*), and house finch (*Carpodacus mexicanus*) in addition to the migratory species and raptors described above under Migratory Birds and previously under Special-Status Species.

A non-native gallinaceous species widely introduced as a gamebird, the chukar (*Alectoris chukar*), is present in relatively low numbers on the nearby slopes below the Roan Cliffs.

REPTILES AND AMPHIBIANS

The project area is within elevational range of most reptile species known to occur in Garfield County. Species most likely to occur include the short-horned lizard, (*Phrynosoma hernandesi*), western fence lizard (*Sceloporus undulatus*), tree lizard (*Urosaurus ornatus*), and gopher snake (bullsnake) (*Pituophis catenifer*) in pinyon-juniper woodlands, sagebrush shrublands, or grassy clearings. Other reptiles potentially present along

riparian areas are the milk snake (*Lampropeltis triangulum*), western terrestrial garter snake (*Thamnophis elegans*), and smooth green snake (*Liochlorophis vernalis*).

The area is also within the known range of the Great Basin spadefoot [toad] (*Spea intermontana*), Woodhouse's toad (*Anaxyrus woodhousii*), and western chorus frog (*Pseudacris triseriata*). Within the CRVFO and vicinity, the spadefoot toad and the true toad occur primarily along ephemeral washes that do not support fish and contain pools of water for a period of at least a few weeks every spring. The chorus frog occurs primarily in cattail and bulrush wetlands and along the vegetated margins of seasonal or perennial ponds and slow-flowing streams.

Environmental Consequence

Proposed Action

Direct impacts to terrestrial wildlife from the Proposed Action may include mortality, disturbance, nest abandonment/nesting attempt failure, or site avoidance/displacement from otherwise suitable habitats. These effects could result from the 8.27 acres of habitat loss or modification, increased noise from vehicles and operation of equipment, increased human presence, and collisions between wildlife and vehicles. Impacts would be more substantial during critical seasons such as winter (deer and elk) or the spring/summer breeding season (raptors, songbirds, amphibians).

Deer and elk are often restricted to smaller areas during the winter months and may expend high amounts of energy to move through snow, locate food, and maintain body temperature. Disturbance during the winter can displace wildlife, depleting much-needed energy reserves and may lead to decreased over winter survival. Additional, indirect habitat loss may occur if increased human activity (e.g., traffic, noise) associated with infrastructure causes intolerant species to be displaced or alter their habitat use patterns. The extent of indirect habitat loss varies by species, the type and duration of the disturbance, and the amount of screening provided by vegetation and topography. In general, disturbance-related impacts are temporary, with patterns of distribution and habitat use returning to predisturbance conditions rather quickly when disturbance stops.

Because the raptor nests identified during project surveys were not active during the 2013 nesting season, no raptor nesting TL will be applied if the project is initiated in summer or fall of 2013. However, if the operator postpones the project until February 1, 2014, or later, a raptor nesting TL will be applied as a COA (Appendix A) to prohibit initiation of construction, drilling, or completion activities at the GM 32-4 pad from the period May 1 to July 1 unless an updated survey documents that no nests are occupied during that breeding season.

No Action Alternative

Under the No Action Alternative, the new Federal horizontal well on the existing GM 32-4 pad would not be drilled, the 6.29 acres of associated surface disturbance on BLM land would not occur, and installation of new buried pipelines would not be needed. The result would be no new impacts to terrestrial wildlife.

Analysis on Public Land Health Standard 3 for Plant and Animal Communities (partial, see also Vegetation and Wildlife, Aquatic)

According to a recent land health assessment, habitat conditions within this area appear suitable for aquatic species known or likely to occur (BLM 2005). Sustained development and the proliferation of roads, well pads, pipelines, compressor stations, tank farms and other surface facilities would continue to reduce habitat size and affect both habitat quality and quantity. The potential to impact some species would increase as

development continues. Although the contribution of the Proposed Action is in itself small, it may further trend the area away from meeting Standard 3 for terrestrial wildlife.

The No Action Alternative would not result in a failure of the area to achieve Standard 3 because the proposed developments would not occur.

SUMMARY OF CUMULATIVE IMPACTS

Historically, habitat loss or modification in the CRVFO areas was characteristic of agricultural, ranching lands, rural residential, with localized industrial impacts associated with the railroad and I-70 corridors and the small communities. More recently, the growth of residential and commercial uses, utility corridors, oil and gas developments, and other rural industrial uses (e.g., gravel mining along the Colorado River) has accelerated the accumulation of impacts in the area. Cumulative impacts have included (1) direct habitat loss, habitat fragmentation, and decreased habitat effectiveness; (2) increased potential for runoff, erosion, and sedimentation; (3) expansion of noxious weeds and other invasive species; (4) increased fugitive dust from construction of oil and gas pads, roads, and pipelines and associated truck travel; (5) increased noise, especially along access and haul roads; (6) increased potential for spills and other releases of chemical pollutants; and (7) decreased scenic quality.

Although none of the cumulative impacts was described in the 1999 FSEIS (BLM 1999a) as significant, and while new technologies and regulatory requirements have reduced the impacts of some land uses, it is clear that past, present, and reasonably foreseeable future actions have had and would continue to have adverse effects on various elements of the human environment. Anticipated impacts for existing and future actions range from negligible to locally major, and primarily negative, for specific resources.

The primary bases for this assessment are twofold: First, although the rate of development, including oil and gas development, has slowed in recent years due to the general economic downturn and depressed natural gas prices, some development continues to occur, adding to the previous residential, commercial, and industrial growth, the previous habitat loss, modification, and fragmentation, and the amount of vehicular traffic and equipment operations associated with long-term production and maintenance. Second, most of the oil and gas development has occurred on private lands where mitigation measures designed to protect and conserve resources may not be in effect to the same extent as on BLM lands. However, COGCC regulations enacted in recent years have closed considerably the former gap between the potential environmental impacts associated with development of private versus Federal fluid mineral resources.

It is clear that the Proposed Action would contribute to the collective adverse impact for some resources. Although the contribution would be minor, the Proposed Action would contribute incrementally to the collective impact to air quality, vegetation, migratory birds, terrestrial wildlife, and other resources.

PERSONS AND AGENCIES CONSULTED

Colorado Oil and Gas Conservation Commission – Dave Kubezko

WPX Energy Rocky Mountain LLC: April Mestas, Adam Tankersley, Kris Meil, Wally Hammer, Joe Weaver, Jr.

INTERDISCIPLINARY REVIEW

BLM staff who participated in the preparation of this EA, including review of survey results submitted by the operator's consultants, evaluation of potential impacts from implementation of the Proposed Action, and identification of appropriate COAs to be attached and enforced by BLM, are listed in Table 15.

Table 15. BLM Interdisciplinary Team Authors and Reviewers

<i>Name</i>	<i>Title</i>	<i>Areas of Participation</i>
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Jim Byers	Natural Resource Specialist	Project Lead, Access and Transportation, Range Management, Recreation, Socioeconomics, Wastes
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Shauna Kocman, Ph.D., P.E.	Petroleum Engineer	Air Quality, Noise, Soils, Surface Water, Downhole COAs
Julie McGrew	Natural Resource Specialist	Visual Resources
Judy Perkins, Ph.D.	Botanist	Invasive Non-Native Species, Special Status Plants, Vegetation
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special Status Animals, Aquatic and Terrestrial Wildlife
Todd Sieber	Geologist	Geology and Minerals, Groundwater, Fossil Resources

REFERENCES CITED

Angold, P.G. 1997. The impact of a road upon adjacent heathland vegetation: effects on plant species composition. *Journal of Applied Ecology*, 34:409-417.

Auerbach, N.A., M.D. Walker, and D.A. Walker. 1997. Effects of roadside disturbance on substrate and vegetation properties in arctic tundra. *Ecological Applications*, 7:218-235.

Bhattacharya, M., R.B. Primack, and J. Gerwien. 2002. Are roads and railroads barriers to bumblebee movement in a temperate suburban conservation area? *Biological Conservation*, 109:37-45.

Bureau of Land Management (BLM). 1984. Glenwood Springs Resource Management Plan. Glenwood Springs Field Office, Colorado.

_____. 1986. BLM Manual Handbook 8410-1-Visual Resource Inventory.

_____. 1991. Record of Decision, Oil and Gas Plan Amendment. Glenwood Springs Field Office, Colorado.

_____. 1999a. Oil & Gas Leasing & Development – Final Supplemental Environmental Impact Statement. Glenwood Spring Field Office, Colorado.

_____. 1999b. Oil & Gas Leasing & Development – Record of Decision and Resource Management Plan Amendment. Glenwood Spring Field Office, Colorado.

_____. 2005. Rifle-West Watershed Land Health Assessment. Glenwood Springs Field Office, Colorado.

_____. 2006. Final Roan Plateau Resource Management Plan Amendment & Environmental Impact Statement, Volume III, Appendix C. Glenwood Springs Field Office, Colorado.

———. 2007a. Federal Mineral Leasing Act of 1920 as Amended. Oil and Gas Royalty Permittee Fees Page. 6. www.blm.gov/pgdata/...minerals.../MineralLeasingAct1920.pdf

———. 2007b. Final biological assessment, vegetation treatments on BLM lands in 17 western states. Reno, NV.

———. 2011. Air Resources Technical Support Document. Colorado River Valley Field Office, CO <http://www.blm.gov/co/st/en/fo/crvfo.html>

City Data. 2012. Garfield County, Colorado. http://www.city-data.com/county/Garfield_County-CO.html.

Cole, R.D., G.J. Daub, and L.K. Weston. 1995. Review of geology, mineral resources, and ground-water hydrology of Green River Formation, north-central Piceance Creek Basin, Colorado. In W.R. Averett (Ed.), *The Green River Formation in Piceance Creek and Eastern Uinta Basins: Grand Junction, Colorado*, Grand Junction Geological Society, p. 63-81.

Colorado Department of Labor and Employment (CDLE). 2013. Colorado LMI Gateway. Summary area Profile for Garfield County, Colorado. <http://www.colmigateway.com/vosnet/lmi/area/areasummary.aspx?session=areadetail&geo=0804000045>

Colorado Department of Public Health and Environment (CDPHE). 2007. Water Quality Control Commission (WQCC), Regulation No. 37, Classifications and numeric standards for Lower Colorado River basin and tables. Amended February 8, 2010; effective June 3, 2010. Available online.

———. 2010. Water Quality Control Commission (WQCC), Regulation No. 93, 2006 Section 303(d) List Water-Quality-Limited Segments Requiring TMDLs.

Colorado Department of Local Affairs (CDOLA). 2012. Population forecasts – years 2000 to 2040. Table III –C-1. Preliminary population forecasts for Colorado counties, 2000-2040. <http://www.colorado.gov/cs/Satellite?c=Page&childpagename=DOLA-Main%2FCBONLayout&cid=1251593346867&pagename=CBONWrapper>

———. 2013a. State Demography Office, Profile System, Colorado County Profile System, Results Garfield County 2000 – 2011. https://dola.colorado.gov/demog_webapps/psc_parameters.jsf.

———. 2013b. 2010 Census data for Colorado: race & ethnicity (including 18+, % and Absolute Change from 2000 to 2010) by County. <http://dola.colorado.gov/dlg/demog/2010censusdata.html>

———. 2013c. 2010 Census Data for Colorado, 2010 Hispanic or Latino (of any race) Population and Percent Change, Colorado Counties – Total Population <http://dola.colorado.gov/dlg/demog/2010censusdata.html>.

Colorado Geological Survey (CGS). 2003. Ground Water Atlas of Colorado, Special Publication 53, pgs. 97-106.

Colorado Oil and Gas Commission (COGCC). 2008. Amended Rules. 800 Series Aesthetic and Noise Control Regulations Regulation 801. <http://cogcc.state.co.us/>

———. 2013a. Colorado Oil and Gas Information System (COGIS) Production. <http://cogcc.state.co.us/cogis/ProductionSearch.asp>.

———. 2013b. Colorado Oil and Gas Drilling Permits. <http://cogcc.state.co.us/>.

Colorado Parks and Wildlife (CPW). 2011. National Diversity Information Source (CPW-NDIS). Elk and mule deer habitat GIS data.

Davies, R. J., S. Mathias, J. Moss, S. Hustoft, and L Newport. 2012. Hydraulic Fractures: How far can they go? *Marine and Petroleum Geology* 37(1):1-6. November.

EnerMax, Inc. 2007. Hydraulic fracturing. <http://www.enermaxinc.com/hydraulic-fracturing>.

Farmer, A.M. 1993. The effects of dust on vegetation – a review. *Environmental Pollution*, 79:63-75.

Field, J.P., J. Belnap, D.D. Breshears, J.C. Neff, G.S. Okin, J.J. Whicker, T.H. Painter, S. Ravi, R.C. Reheis, and R.L. Reynolds. 2010. The ecology of dust. *Frontiers in Ecology and the Environment*, 8:423-430.

Fenneman, N. M. 1946. Physical subdivisions of the United States (Map): U.S. Geological Survey, 1:700,000, 1 sheet.

Fisher, K., and N. Warpinski. 2012. Hydraulic-fracture-height growth: real data. *SPE Production & Operations Journal* 27(1):8-19. SPE-145949-PA. <http://dx.doi.org/10.2118/145949-PA>.

Franczyk, K.J., J.K. Pitman, and D.J. Nichols. 1990. Sedimentology, mineralogy, and depositional history of some Uppermost Cretaceous Lowermost Tertiary rocks along the Utah Book and Roan Cliffs east of the Green River: U.S. Geological Survey Bulletin 1787:27 pp.

Garfield County. 2013a. About Garfield County. <http://www.garfield-county.com/about-garfield-county/index.aspx>.

———. 2013b. Garfield County Administration, 2012 Abstract of Assessment. www.garfield-county.com/assessor/documents/2012-Abstract-brochure.pdf

———. 2013c. Garfield County Administration, Impacts of Oil and Gas Industry on Garfield County. www.garfield-county.com/.../Economic-Impacts-of-Oil-and-Gas-Industry-on-Garfield-County.pdf

George, R.D. 1927. *Geology and natural resources of Colorado*. University of Colorado, Boulder.

Gelbard, J.L., and J. Belnap. 2003. Roads as conduits for exotic plant invasions in a semiarid landscape. *Conservation Biology*, 17(2):420-432.

Gieselman, T.M. 2010. Changes in grassland community composition at human-induced edges in the south Okanagan. Master of Science Dissertation. The University of British Columbia, Vancouver.

Green, C.A., R.D. Barree, and J.L. Miskimins. 2009. Hydraulic-fracture-model sensitivity analysis of a massively stacked, lenticular, tight gas reservoir. *SPE Production & Operations Journal* 24(1):66-73. SPE 106270-PA. February.

Harris, C.M. 1991. *Handbook of acoustical measurements and noise control*, McGraw-Hill, Inc., New York.

Hemborg, T.H. 2000. Gas production characteristics of the Rulison, Grand Valley, Mamm Creek, and Parachute Fields, Garfield County, Colorado: Turning marginally economic basin-centered tight-gas sands

into profitable reservoirs in the Southern Piceance Basin. Colorado Geological Survey, Resource Series 39. Denver.

Hierro, J.L., D. Villarreal, O. Eren, J.M. Graham, and R.M. Callaway. 2006. Disturbance facilitates invasion: the effects are stronger abroad than at home. *The American Naturalist*, 168(2):144-156.

Johnson, R.C., 1985, Early Cenozoic history of the Uinta and Piceance Creek Basins, Utah and Colorado, with special reference to the development of Eocene Lake Uinta United States: Rocky Mountain Section, Society of Economic Paleontology and Mineralogy: Denver, Colo., p. 247–276.

Johnson, R.C. 1989. Geologic history and hydrocarbon potential of late Cretaceous-age, low-permeability reservoirs, Piceance Basin, western Colorado: U.S. Geological Survey Bulletin 1787, Evolution of sedimentary basins-Uinta and Piceance Basins, chapter E, 51 p.

Johnston, F.M., and S.W. Johnston. 2004. Impacts of road disturbance on soil properties and on exotic plant occurrence in subalpine areas of the Australian Alps. *Arctic, Antarctic, and Alpine Research*, 36:201-207.

Klironomos, J.N. 2002. Feedback with soil biota contributes to plant rarity and invasiveness in communities. *Nature*, 417:67-70.

Kuuskräa, V.A. 1997. Producing massively stacked lenticular sands of Colorado's Piceance Basin: Gas Tips – A Publication of Gas Research Institute GRI-97/0206:4-11.

La Plata County, Colorado. 2002. Final La Plata County impact report. October.

Larson, D.L. 2003. Native weeds and exotic plants: relationships to disturbance in mixed-grass prairie. *Plant Ecology*, 169:317-333.

Lorenz, J.C. 1989. Reservoir sedimentology of rocks of the Mesaverde Group, multiwall experiment site and east-central Piceance Basin, northwest Colorado. In B.E. Law and C.W. Spencer, C.W. (Eds.), *Geology of tight gas reservoirs in the Pinedale Anticline area, Wyoming, and at the multiwall experiment site, Colorado*: U.S. Geological Survey Bulletin 1886:K1-K24.

Maxwell, S.C. 2011. Hydraulic fracture height growth. Canadian Society of Exploration Geophysicists (CSEG) Recorder. November.

Murphy, P.C., and D. Daitch, 2007. Paleontological overview of oil shale and tar sands areas in Colorado, Utah, and Wyoming, p. 58.

National Academy of Sciences (NAS). 2007. Weather and climate extremes in a changing climate. National Academies Press. <http://dels.nas.edu/globalchange/reportDetail.php?id=4288&c=clim&t=pubs>.

———. 2012. *Induced Seismicity Potential in Energy Technologies*. National Academy Press, Washington, DC.

Osborne, J.L., and I.H. Williams. 2001. Site constancy of bumble bees in an experimentally patchy habitat. *Agriculture, Ecosystems, and Environment*, 83:129-141.

O'Sullivan, R.B. Geologic Map of the Anvil Points Quadrangle, Garfield County, Colorado. 1986. Scale 1:24,000. Map MF-1882.

- Palisch, T.T. M.A. Chapman, and J. Godwin. 2012. Hydraulic Fracture Design Optimization in Unconventional Reservoirs: A Case History. Paper SPE 160206 presented at the Annual Technical Conference and Exhibition, San Antonio, TX. October 8-10.
- Parendes, L.A., and J.A. Jones. 2000. Role of light availability and dispersal in exotic plant invasion along roads and streams in the H.J. Andrews Experimental Forest, Oregon. *Conservation Biology*, 14(1):64-75.
- Reinhart, K.O., and R.M. Callaway. 2006. Soil biota and invasive plants. *New Phytologist*, 170:445-447.
- Robson, S.G., and G.J. Saulnier, Jr. 1981. Hydrogeochemistry and simulated solute transport, Piceance Basin, northwestern Colorado. U.S. Geological Survey Professional Paper 1196, 65 p.
- Schmidt, W. 1989. Plant dispersal by motor cars. *Vegetatio*, 80:147-152.
- Sharifi, M.R., A.C. Gibson, and P.W. Rundel. 1997. Surface dust impacts on gas exchange in Mojave Desert shrubs. *Journal of Applied Ecology*, 34(4):837-846.
- Spencer, C.W., and Wilson, R.J., 1988. Petroleum geology and principal exploration plays in the Uinta-Piceance-Eagle Basins Province, Utah and Colorado: U.S. Geological Survey Open-File Report 88-450-G, 35 p.
- Thompson, J.R., P.W. Mueller, W. Fluckiger, and A.J. Rutter. 1984. The effect of dust on photosynthesis and its significance for roadside plants. *Environmental Pollution (Series A)*, 34:171-190.
- U.S. Department of Agriculture (USDA). 1985. Soil survey of Rifle area, Colorado: parts of Garfield and Mesa Counties. Soil Conservation Service [Natural Resources Conservation Service].
- U.S. Department of Commerce (USDOC). 2012. Regional Economic Information System, Bureau of Economic Analysis (BEA). Table CA 1-3 Personal Income Summary.
<http://www.bea.gov/iTable/iTable.cfm?ReqID=70&step=1.#reqid=70&step=30&isuri=1&7028=-1&7040=-1&7083=Levels&7031=08000&7022=20&7023=7&7024=Non-Industry&7025=4&7026=08045&7027=2011,2010,2009,2008,2007,2006,2005,2004,2003,2002,2001,2000&7001=720&7029=20&7090=70&7033=-1>
- U.S. Department of Energy (DOE). 2009. Modern Shale Gas Development in the United States: A Primer. National Energy Technology Laboratory, Morgantown, WV, and Office of Fossil Energy, Washington, DC. April.
- . 2013. U.S. Energy Information Administration U.S. Natural Gas Wellhead Price.
<http://www.eia.gov/dnav/ng/hist/n9190us3a.htm>.
- U.S. Department of the Interior (USDI). 2013. Payments in Lieu of Taxes (PILT) County Payments and Acres. USDI National Business Center <http://www.doi.gov/pilt/index.cfm>.
- U.S. Department of the Interior and U.S. Department of Agriculture (USDI and USDA). 2007. Surface operating standards and guidelines for oil and gas exploration and development. The Gold Book. Fourth edition.

U.S. Environmental Protection Agency (EPA). 1974. Information on noise levels identified as requisite to protect public health and welfare with an adequate margin of safety. EPA-550/9-74-004, Arlington, VA.

———. 2004. Evaluation of impacts to underground sources of drinking water by hydraulic fracturing of coalbed methane reservoirs. Document #EPA 816-R-04-003. Office of Ground Water and Drinking Water Drinking Water Protection, Washington, DC.

———. 2006. Drinking water standards and health advisories, EPA 822-R-06-013, August 2006. Available online.

U.S. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern. United States Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. [Online version available at <<http://www.fws.gov/migratorybirds/>>]

U.S. Geological Survey (USGS). 2007. Water resources of the United States, NWISWeb. Water quality samples for the nation, Colorado River near DeBeque. Available online.

Vinton, M.A., and E.M. Goergen. 2006. Plant-soil feedbacks contribute to the persistence of *Bromus inermis* in tallgrass prairie. *Ecosystems*, 9:967-976.

Vogelsgang, K.M., and J.D. Bever. 2009. Mycorrhizal densities decline in association with nonnative plants and contribute to plant invasion. *Ecology*, 90 (2):399-407.

Warpinski, N.R. 2011. Fracture Growth in Layered and Discontinuous Media. Proceedings of the Technical Workshops for the Hydraulic Fracturing Study: Fate and Transport. U.S. Environmental Protection Agency, Washington, DC. May.

Warpinski, N.R., J. Du, and U. Zimmer. 2012. Measurements of Hydraulic-Fracture Induced Seismicity in Gas Shales. Paper SPE 151597 presented at the SPE Hydraulic Fracture Technology Conference, The Woodlands, TX. February 6-8.

Weiner, R.J., and J.D. Haun. 1960. Guide to the geology of Colorado. Geological Society of America.

WestWater Engineering (WWE) 2012. Biological Survey Report for Riley Gulch Water Tie-In Project. WPX Energy, Parachute Colorado.

———. 2013. Special Status Plant Inventory Report for GM 32-4 Pad, Access Road, and Pipelines. WPX Energy, Parachute Colorado.

Zhai, Z., and M.M. Sharma. 2005. A new approach to modeling hydraulic fractures in unconsolidated sands. Paper SPE 96246 presented at the SPE Annual Technical Conference and Exhibition, Dallas, TX. October 9-12.

Zwaenepoel, A., P. Roovers, and M. Hermy. 2006. Motor vehicles as vectors of plant species from road verges in a suburban environment. *Basic and Applied Ecology*, 7:83-93.

APPENDIX A

**GM 32-4 Pad
Surface-Use and Downhole Conditions of Approval**

Left blank for two-sided copying.

**SURFACE-USE CONDITIONS OF APPROVAL
DOI-BLM-CO-N040-2013-0067-EA**

GENERAL SURFACE-USE COAS

The following surface-use COAs shall be implemented, where applicable and feasible, to reduce impacts from project activities. Site-specific surface-use COAs and downhole COAs follow these general COAs.

1. **Administrative Notification.** The operator shall notify the BLM representative at least 48 hours prior to initiation of construction. If requested by the BLM representative, the operator shall schedule a pre-construction meeting, including key operator and contractor personnel, to ensure that any unresolved issues are fully addressed prior to initiation of surface-disturbing activities or placement of production facilities. No construction activities shall commence without staking of pad construction limits, pad corners, and road/pipeline centerlines and disturbance corridors.
2. **Pad and Road Construction and Maintenance.** Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. Initial gravel application shall be a minimum of 6 inches. The operator shall provide timely year-round road maintenance and cleanup on the access roads. A regular schedule for maintenance shall include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement, and dust abatement. When rutting within the traveled way becomes greater than 6 inches, blading and/or gravelling shall be conducted as approved by the BLM.
3. **Drill Cuttings Management.** Cuttings generated from the numerous planned well bores shall be worked through a shaker system on the drill rig, mixed with a drying agent, if necessary, and deposited in the planned cuttings trench or piled on location against the cut slope for later burial during the interim reclamation earthwork. The cuttings shall be remediated per COGCC regulations (Table 910-1 standards) prior to earthwork reshaping related to well pad interim reclamation.
4. **Dust Abatement.** The operator shall implement dust abatement measures as needed to prevent fugitive dust from vehicular traffic, equipment operations, or wind events. The BLM may direct the operator to change the level and type of treatment (watering or application of various dust agents, surfactants, and road surfacing material) if dust abatement measures are observed to be insufficient to prevent fugitive dust.
5. **Drainage Crossings and Culverts.** Construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) shall be timed to avoid high flow conditions. Construction that disturbs any flowing stream shall utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

Culverts at drainage crossings shall be designed and installed to pass a 25-year or greater storm event. On perennial and intermittent streams, culverts shall be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage shall be 24 inches. Crossings of drainages deemed to be jurisdictional Waters of the U.S. pursuant to Section 404 of the Clean Water Act may require additional culvert design capacity. Due to the flashy nature of area drainages and anticipated culvert maintenance, the U.S. Army Corps of Engineers (USACE) recommends designing drainage crossings for the 100-year event. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17.

Pipelines installed beneath stream crossings shall be buried at a minimum depth of 4 feet below the channel substrate to avoid exposure by channel scour and degradation. Following burial, the channel grade and substrate composition shall be returned to pre-construction conditions.

6. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into Waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to Waters of the U.S. may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.
7. Reclamation. The goals, objectives, timelines, measures, and monitoring methods for final reclamation of oil and gas disturbances are described in Appendix I (Surface Reclamation) of the 1998 Draft Supplemental EIS (DSEIS). Specific measures to follow during interim and temporary (pre-interim) reclamation are described below.
 - a. Reclamation Plans. In areas that have low reclamation potential or are especially challenging to restore, reclamation plans will be required prior to APD approval. The plan shall contain the following components: detailed reclamation plans, which include contours and indicate irregular rather than smooth contours as appropriate for visual and ecological benefit; timeline for drilling completion, interim reclamation earthwork, and seeding; soil test results and/or a soil profile description; amendments to be used; soil treatment techniques such as roughening, pocking, and terracing; erosion control techniques such as hydromulch, blankets/matting, and wattles; and visual mitigations if in a sensitive VRM area.
 - b. Deadline for Interim Reclamation Earthwork and Seeding. Interim reclamation to reduce a well pad to the maximum size needed for production, including earthwork and seeding of the interim reclaimed areas, shall be completed within 6 months following completion of the last well planned to be drilled on that pad as part of a continuous operation. If a period of greater than one year is expected to occur between drilling episodes, BLM may require implementation of all or part of the interim reclamation program.

Reclamation, including seeding, of temporarily disturbed areas along roads and pipelines, and of topsoil piles and berms, shall be completed within 30 days following completion of construction. Any such area on which construction is completed prior to December 1 shall be seeded during the remainder of the early winter season instead of during the following spring, unless BLM approves otherwise based on weather. If road or pipeline construction occurs discontinuously (e.g., new segments installed as new pads are built) or continuously but with a total duration greater than 30 days, reclamation, including seeding, shall be phased such that no portion of the temporarily disturbed area remains in an unreclaimed condition for longer than 30 days. BLM may authorize deviation from this requirement based on the season and the amount of work remaining on the entirety of the road or pipeline when the 30-day period has expired.

If requested by the project lead NRS for a specific pad or group of pads, the operator shall contact the NRS by telephone or email approximately 72 hours before reclamation and reseeding begin. This will allow the NRS to schedule a pre-reclamation field visit if needed to ensure that all parties are in agreement and provide time for adjustments to the plan before work is initiated.

The deadlines for seeding described above are subject to extension upon approval of the BLM based on season, timing limitations, or other constraints on a case-by-case basis. If the BLM

approves an extension for seeding, the operator may be required to stabilize the reclaimed surfaces using hydromulch, erosion matting, or other method until seeding is implemented.

- c. Topsoil Stripping, Storage, and Replacement. All topsoil shall be stripped following removal of vegetation during construction of well pads, pipelines, roads, or other surface facilities. In areas of thin soil, a minimum of the upper 6 inches of surficial material shall be stripped. The BLM may specify a stripping depth during the onsite visit or based on subsequent information regarding soil thickness and suitability. The stripped topsoil shall be stored separately from subsoil or other excavated material and replaced prior to final seedbed preparation. The BLM best management practice (BMP) for the Windrowing of Topsoil (COA #17) shall be implemented for well pad construction whenever topography allows.
- d. Seedbed Preparation. For cut-and-fill slopes, initial seedbed preparation shall consist of backfilling and recontouring to achieve the configuration specified in the reclamation plan. For compacted areas, initial seedbed preparation shall include ripping to a minimum depth of 18 inches, with a maximum furrow spacing of 2 feet. Where practicable, ripping shall be conducted in two passes at perpendicular directions. Following final contouring, the backfilled or ripped surfaces shall be covered evenly with topsoil.

Final seedbed preparation shall consist of scarifying (raking or harrowing) the spread topsoil prior to seeding. If more than one season has elapsed between final seedbed preparation and seeding, and if the area is to be broadcast-seeded or hydroseeded, this step shall be repeated no more than 1 day prior to seeding to break up any crust that has formed.

If directed by the BLM, the operator shall implement measures following seedbed preparation (when broadcast-seeding or hydroseeding is to be used) to create small depressions to enhance capture of moisture and establishment of seeded species. Depressions shall be no deeper than 1 to 2 inches and shall not result in piles or mounds of displaced soil. Excavated depressions shall not be used unless approved by the BLM for the purpose of erosion control on slopes. Where excavated depressions are approved by the BLM, the excavated soil shall be placed only on the downslope side of the depression.

If directed by the BLM, the operator shall conduct soil testing prior to reseeding to identify if and what type of soil amendments may be required to enhance revegetation success. At a minimum, the soil tests shall include texture, pH, organic matter, sodium adsorption ratio (SAR), cation exchange capacity (CEC), alkalinity/salinity, and basic nutrients (nitrogen, phosphorus, potassium [NPK]). Depending on the outcome of the soil testing, the BLM may require the operator to submit a plan for soil amendment. Any requests to use soil amendments not directed by the BLM shall be submitted to the CRVFO for approval.

Seedbed preparation is not required for topsoil storage piles or other areas of temporary seeding.

- e. Seed Mixes. A seed mix consistent with BLM standards in terms of species and seeding rate for the specific habitat type shall be used on all BLM lands affected by the project (see Attachment 1 of the letter provided to operators dated October 23, 2012). Note that temporary seeding no longer allows the use of sterile hybrid non-native species.

For private surfaces, the menu-based seed mixes are recommended, but the surface landowner has ultimate authority over the seed mix to be used in reclamation. The seed shall contain no prohibited or restricted noxious weed seeds and shall contain no more than 0.5% by weight of other weed seeds. Seed may contain up to 2.0% of "other crop" seed by weight, including the

seed of other agronomic crops and native plants; however, a lower percentage of other crop seed is recommended. Seed tags or other official documentation shall be submitted to BLM at least 14 days before the date of proposed seeding for acceptance. Seed that does not meet the above criteria shall not be applied to public lands.

- f. Seeding Procedures. Seeding shall be conducted no more than 24 hours following completion of final seedbed preparation.

Where practicable, seed shall be installed by drill-seeding to a depth of 0.25 to 0.5 inch. Where drill-seeding is impracticable, seed may be installed by broadcast-seeding at twice the drill-seeding rate, followed by raking or harrowing to provide 0.25 to 0.5 inch of soil cover or by hydroseeding and hydromulching. Hydroseeding and hydromulching shall be conducted in two separate applications to ensure adequate contact of seeds with the soil.

If interim revegetation is unsuccessful, the operator shall implement subsequent reseeding until interim reclamation standards are met.

- g. Mulch. Mulch shall be applied within 24 hours following completion of seeding. Mulch may consist of either hydromulch or of certified weed-free straw or certified weed-free native grass hay crimped into the soil.

NOTE: Mulch is not required in areas where erosion potential mandates use of a biodegradable erosion-control blanket (straw matting).

- h. Erosion Control. Cut-and-fill slopes shall be protected against erosion with the use of water bars, lateral furrows, or other BMPs approved by the BLM. Additional BMPs such as biodegradable wattles, weed-free straw bales, or silt fences shall have be employed as necessary to reduce transport of sediments into the drainages. The BLM may, in areas with high erosion potential, require use of hydromulch or biodegradable blankets/matting to ensure adequate protection from slope erosion and offsite transport of sediments and to improve reclamation success
- i. Site Protection. The pad shall be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species are firmly established, whichever comes later. The seeded species will be considered firmly established when at least 50% of the new plants are producing seed. The BLM will approve the type of fencing.
- j. Monitoring. The operator shall conduct annual monitoring surveys of all sites categorized as “operator reclamation in progress” and shall submit an annual monitoring report of these sites, including monitoring protocols used, to the BLM by **December 31** of each year. The monitoring program shall use the four Reclamation Categories defined in Appendix I of the 1998 DSEIS to assess progress toward reclamation objectives. The annual report shall document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report shall identify appropriate corrective actions. Upon review and approval of the report by the BLM, the operator shall be responsible for implementing the corrective actions or other measures specified by the BLM.
8. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive Weed Management Plan for Oil and Gas Operators*, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports and Pesticide Application Records (PARs) shall be submitted to BLM by **December 1**.

9. Big Game Winter Range Timing Limitation. To minimize impacts to wintering big game, no construction, drilling or completion activities shall occur during a Timing Limitation (TL) period from **January 1 through March 1 annually.**
10. Bald and Golden Eagles. It shall be the responsibility of the operator to comply with the Bald and Golden Eagle Protection Act (Eagle Act) with respect to “take” of either eagle species. Under the Eagle Act, “take” includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. “Disturb” means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. Avoidance of eagle nest sites, particularly during the nesting season, is the primary and preferred method to avoid a take. Any oil or gas construction, drilling, or completion activities planned within 0.5 mile of a bald or golden eagle nest, or other associated activities greater than 0.5 miles from a nest that may disturb eagles, should be coordinated with the BLM project lead and BLM wildlife biologist and the USFWS representative to the BLM Field Office (970-876-9051).
11. Raptor Nesting. Raptor nest surveys in the project vicinity resulted in the location of one or more raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. However, because all of the nests were inactive during the 2013 nesting season, no seasonal constraints are placed on development during the 2013 calendar year.

In the event the project is postponed by the operator to February 1, 2014, or later, a 60-day Timing Limitation (TL) shall be applied to prohibit initiation of construction, drilling, or completion activities within the buffer widths specified above from **May 1 to July 1** unless subsequent surveys determine that no nests are occupied during that breeding season. The BLM may grant an exception to the TL in subsequent nesting seasons without requiring a follow-up survey if the nest was severely dilapidated when identified, indicating protracted disuse and low likelihood of reuse.

If project-related activities are initiated within the specified buffer distance of any active nest, even if outside the 60-day TL period specified in this COA, the operator remains responsible for compliance with the MBTA with respect to a “take” of birds or of active nests (those containing eggs or young), including nest failure caused by human activity (see COA for Migratory Birds).

12. Migratory Birds – Birds of Conservation Concern. Pursuant to BLM Instruction Memorandum 2008-050, all vegetation removal or surface disturbance in previously undisturbed lands providing potential nesting habitat for Birds of Conservation Concern (BCC) is prohibited from **May 1 to July 1**. An exception to this TL may be granted if nesting surveys conducted no more than one week prior to surface-disturbing activities indicate that no BCC species are nesting within 30 meters (100 feet) of the area to be disturbed. Nesting shall be deemed to be occurring if a territorial (singing) male is present within the distance specified above. Nesting surveys shall include an aural survey for diagnostic vocalizations in conjunction with a visual survey for adults and nests. Surveys shall be conducted by a qualified breeding bird surveyor between sunrise and 10:00 AM under favorable conditions for detecting and identifying a BCC species. This provision does not apply to ongoing construction, drilling, or completion activities that are initiated prior to May 1 and continue into the 60-day period at the same location.
13. Migratory Birds – General. It shall be the responsibility of the operator to comply with the Migratory Bird Treaty Act (MBTA) with respect to “take” of migratory bird species, which includes injury and

direct mortality resulting from human actions not intended to have such result. To minimize the potential for the take of a migratory bird, the operator shall take reasonable steps to prevent use by birds of fluid-containing pits associated with oil or gas operations, including but not limited to reserve pits, produced-water pits, hydraulic fracturing flowback pits, evaporation pits, and cuttings trenches. Liquids in these pits—whether placed or accumulating from precipitation—may pose a risk to birds as a result of ingestion, absorption through the skin, or interference with buoyancy and temperature regulation.

Based on low effectiveness of brightly colored flagging or spheres suspended over a pit, the operator shall install netting with a mesh size of 1 to 1.5 inches, and suspended at least 4 feet above the fluid surface, on all pits into which fluids are placed, except for storage of fresh water in a pit that contains no other material. The netting shall be installed within 24 hours of placement of fluids into a pit. The requirement for netting does not apply to pits during periods of continuous, intensive human activity at the pad, such as drilling and hydraulic fracturing phases or, as pertains to cuttings trenches, during periods of active manipulation for cuttings management, remediation of contaminated materials, or other purposes.

In addition to netting of pits, oil slicks and oil sheens shall be promptly skimmed off the fluid surface. The requirement for prompt skimming of oil slicks and oil sheens also applies to cuttings trenches in which precipitation has accumulated. All mortality or injury to birds shall be reported immediately to the BLM project lead and to the USFWS representative to the BLM Field Office at 970-243-2778 x28 and visit <http://www.fws.gov/mountain-prairie/contaminants/oilpits.htm>.

14. Range Management. Range improvements (fences, gates, reservoirs, pipelines, etc) shall be avoided during development of natural gas resources to the maximum extent possible. If range improvements are damaged during exploration and development, the operator will be responsible for repairing or replacing the damaged range improvements. If a new or improved access road bisects an existing livestock fence, steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock.
15. Fossil Resources. All persons associated with operations under this authorization shall be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered the operator shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM of the findings. The discovery must be protected until notified to proceed by the BLM.

Where feasible, the operator shall suspend ground-disturbing activities at the discovery site and immediately notify the BLM of any finds. The BLM will, as soon as feasible, have a BLM-permitted paleontologist check out the find and record and collect it if warranted. If ground-disturbing activities cannot be immediately suspended, the operator shall work around or set the discovery aside in a safe place to be accessed by the BLM-permitted paleontologist.

16. Cultural Education/Discovery. All persons in the area who are associated with this project shall be informed that if anyone is found disturbing historic, archaeological, or scientific resources, including collecting artifacts, the person or persons will be subject to prosecution.

Pursuant to 43 CFR 10.4(g), the BLM shall be notified by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4 (c) and (d), activities shall stop in the vicinity

of the discovery, and the discovery shall be protected for 30 days or until notified by the BLM to proceed.

If in connection with operations under this contract, the operator, its contractors, their subcontractors, or the employees of any of them discovers, encounters, or becomes aware of any objects or sites of cultural value or scientific interest such as historic ruins or prehistoric ruins, graves or grave markers, fossils, or artifacts, the operator shall immediately suspend all operations in the vicinity of the cultural resource and shall notify the BLM of the findings (16 USC 470h-3, 36 CFR 800.112). Operations may resume at the discovery site upon receipt of written instructions and authorization by the BLM. Approval to proceed will be based upon evaluation of the resource. Evaluation shall be by a qualified professional selected by the BLM from a Federal agency insofar as practicable. When not practicable, the operator shall bear the cost of the services of a non-Federal professional.

Within five working days, the BLM will inform the operator as to:

- whether the materials appear eligible for the National Register of Historic Places
- what mitigation measures the holder will likely have to undertake before the site can be used (assuming that *in-situ* preservation is not necessary)
- the timeframe for the BLM to complete an expedited review under 36 CFR 800.11, or any agreements in lieu thereof, to confirm through the SHPO State Historic Preservation Officer that the findings of the BLM are correct and that mitigation is appropriate

The operator may relocate activities to avoid the expense of mitigation and delays associated with this process, as long as the new area has been appropriately cleared of resources and the exposed materials are recorded and stabilized. Otherwise, the operator shall be responsible for mitigation costs. The BLM will provide technical and procedural guidelines for relocation and/or to conduct mitigation. Upon verification from the BLM that the required mitigation has been completed, the operator will be allowed to resume construction.

Antiquities, historic ruins, prehistoric ruins, and other cultural or paleontological objects of scientific interest that are outside the authorization boundaries but potentially affected, either directly or indirectly, by the Proposed Action shall also be included in this evaluation or mitigation. Impacts that occur to such resources as a result of the authorized activities shall be mitigated at the operator's cost, including the cost of consultation with Native American groups.

Any person who, without a permit, injures, destroys, excavates, appropriates or removes any historic or prehistoric ruin, artifact, object of antiquity, Native American remains, Native American cultural item, or archaeological resources on public lands is subject to arrest and penalty of law (16 USC 433, 16 USC 470, 18 USC 641, 18 USC 1170, and 18 USC 1361).

17. Visual Resources. Production facilities shall be placed to avoid or minimize visibility from travel corridors, residential areas, and other sensitive observation points—unless directed otherwise by the BLM due to other resource concerns—and shall be placed as indicated on the plats attached to the APD, unless an alternative placement is approved by the BLM.

To the extent practicable, existing vegetation shall be preserved when clearing and grading for pads, roads, and pipelines. The BLM may direct that cleared trees and rocks be salvaged and redistributed over reshaped cut-and-fill slopes or along linear features.

Above-ground facilities shall be painted **Shadow Gray** to minimize contrast with existing surrounding vegetation or rock outcrops.

During construction, the BLM and WPX representatives shall jointly review construction measures to determine effectiveness in meeting visual resource mitigation measures, and if subtle changes in construction techniques are warranted, they could be directed by the BLM Authorized Officer.

To the extent practicable during interim reclamation, cut and fill slopes shall not exceed 2:1 (horizontal to vertical) when they are recontoured to provide stability and to facilitate vegetation establishment.

18. Windrowing of Topsoil. Topsoil shall be windrowed around the pad perimeter to create a berm that limits and redirects stormwater runoff and extends the viability of the topsoil per BLM Topsoil Best Management Practices (BLM 2009 PowerPoint presentation available upon request from Glenwood Springs Field Office). Topsoil shall also be windrowed, segregated, and stored along pipelines and roads for later spreading across the disturbed corridor during final reclamation. Topsoil berms shall be promptly seeded to maintain soil microbial activity, reduce erosion, and minimize weed establishment.
19. Interim Reclamation Related to Drilling Phases. Within 1 year of completion of all exploratory wells proposed on a pad or within one year of completion of all development wells on a pad (whichever the situation may be), the operator would stabilize the disturbed area by recontouring, mulching, providing run-off and erosion control, replacing topsoil as directed, and seeding with BLM-prescribed native seed mixes (or landowner requested seed mix on Fee surface), and conducting weed control, as necessary. In cases where the exploratory drilling and development drilling on a single pad occur more than 1 year apart, slopes shall be recontoured to the extent necessary to accommodate seeding, and seed mixes required by BLM or requested by the private landowner shall be applied to stabilize the soil between visits per direction of the BLM.

SITE-SPECIFIC COAS APPLICABLE TO THE GM 32-4 PROJECT

The following site-specific surface use COAs are in addition to the standard COAs listed above and all relevant stipulations attached to the respective Federal leases.

1. Project Construction Details.

Tree Clearing: The existing range fence shown on Plat #2 in the APD shall be removed within the project boundaries prior to any tree clearing work. Prior to any pad or road construction work, the trees within the staked pad footprint shall be cleared with a trackhoe with Fecon brushing unit or similar hydro-axe type equipment.

Topsoil Management: Because of limited windrow space surrounding the project, BLM and WPX representatives shall develop a plan during the preconstruction meeting for topsoil storage related to the pad and road work.

Pad Construction Items: All construction work in vicinity of Corner 12 shall remain within the original disturbance footprint of the pad. A rock retaining wall structure shall be installed between Corner 12 and Corner 1 to reduce fillslope impacts and avoid sidecasting fill material in proximity of Riley Gulch. Rock generated from the GR 21-4 road work shall be the source rock for this wall structure, storm water features and culvert inlets and outlets in the project area. The existing, established straw bale structure

bedded and staked along the entire Riley Gulch section of the pad shall be relocated for the new pad footprint and maintained regularly to inhibit erosion and sediment flows into Riley Gulch. The planned culvert near Corner 6 shall be up-sized to 36" diameter unless the existing buried gas trunk lines adjacent and within the Riley Gulch Road restrict the use of the larger diameter culvert.

The drainage in proximity to Corners 6 and 7 shall be isolated from the proposed GR 21-4 road by installation of a sizable deflection berm that parallels the GR 21-4 road. A sizable sediment basin shall be installed at corner 6 to slow the drainage flow before it feeds into the culvert under Riley Gulch Road.

The proposed pad work has a considerable volume of excess material (31,790 cubic yards) which would be used for the following purposes (in priority order):

- (a) placed along Riley Gulch Road below the pad entrance to reduce the steep road grade onto the pad,
- (b) placed along Riley Gulch Road above or west of the pad to improve road drainage and road grades onto the west side of the pad,
- (c) stored along the old GR 21-4 unneeded roadway above Corner 9, and
- (d) hauled to GR 21-4 pad for placement against the steep unreclaimed cutslope.

Road Construction Details. The new access road to the GR 21-4 pad shall be constructed per specifications shown on the Road Construction Plat in the APD. Prior to construction, the road centerline shall be staked and limits of the road disturbance corridor shall be flagged to outline the road work area. Culverts shall be installed along the new road alignment based on the details shown in the Road Construction Plat in the APD.

While providing safe allowances for the buried operating GR 21-4 gas pipeline, the old GR 21-4 roadway shall be stripped of its gravel surfacing and stored on GR 21-4 pad for re-use.

Road Surfacing: After the installation of the planned pipeline upgrades, the access roads serving the GM 32-4 pad and GR 21-4 pad shall be surfaced with a minimum 6-inch depth of gravel prior to mobilization of the drill rig. Furthermore, all road work involving the placement of excess material from the GM 32-4 project to reduce road grades shall be specifically re-surfaced with a minimum of 6-inch depth of gravel. If buried pipeline upgrades are not implemented along the Riley Gulch Road, a minimum 6-inch depth of gravel shall be applied to the road surface prior to mobilization of the drill rig.

Production Equipment Placement: Adequate space for diversion ditching along the pad cutslope and road fillslope shall be provided when setting the production units and tanks as shown on Plat #2 in the APD.

Pad containment berm-spill prevention measures: With the pad being in direct proximity to drainages on all but the north side, there shall be special attention to installing a solid containment berm system around the perimeter of the pad working area. Sediment basins shall be located and designed to readily accept pad drainage with focus of locating these basins near the cut/fill balance line of the pad surface. Using windrowed topsoil as sediment controls and/or basin catchments shall be incorporated into the storm water control plan. Sediment basin outlets with drop-down black piping are discouraged and, if used, such piping shall not feed directly into the nearby drainages. As a minimum, a hand-drawn schematic on Plat #2 shall provide the details for the storm water control plan for this pad. This plan shall be presented to the BLM and approved prior to completion of pad construction earthwork.

Interim Reclamation – Earthwork Reshaping Considerations. Diversion ditches shall be constructed to direct surface flow around the pad perimeter. Pad grading and surfacing with gravel shall be accomplished to direct runoff to the diversion ditches and avoid water ponding on the pad surface.

During the final earthwork and pad grading, a graveled travel way shall be provided for the Riley Gulch Road traffic across the GM 32-4 pad.

During the final earthwork for the interim reclamation on the GM 32-4 pad and the final reclamation on the GR 21-34 access road, the slopes shall be reshaped with a rough finish to control erosion and improve seed bed preparation. The interim reclamation for this project shall involve hydroseeding and hydromulching because of the relatively steep slopes. Soil testing shall be required prior to any reclamation earthwork with objective of using soil amendments for the reclaimed areas based on the soil test results.

Surface Pipeline Considerations: Prior to installation, the surface line alignment between the GM 41-4 and GM 32-4 pads shall be field-reviewed by BLM and WPX representatives specifically to determine how the lines will cross under Riley Gulch Road. Measures to coordinate with planned gas pipeline upgrades along the same road side alignment must be presented. Riley Gulch crossing for the steel surface frac lines shall occur within the existing MV 7-4 access road near the culvert. The frac lines shall be covered with suitable road base material to protect the line integrity and operability, and allow safe, 24/7 traffic access to the MV 7-4 pad.

2. Buried Gas and Water Pipeline Construction Details.

A. Administrative Notification. The operator shall notify the BLM representative at least 48 hours prior to initiation of construction. If requested by the BLM representative, the operator shall schedule a pre-construction meeting, including key operator and contractor personnel, to ensure that any unresolved issues are fully addressed prior to initiation of surface-disturbing activities.

B. Pipeline Construction and Maintenance. The pipelines (natural gas, condensate, and water for production) shall be installed to industry and BLM "Gold Book" standards.

All pipeline(s) shall be buried with a minimum depth of 48 inches from the top of the pipe to the surface. The GR 21-4 gas gathering line and the GR 21-4 water collection line shall be installed concurrently in the same trench. The centerline and disturbance limits of the proposed pipeline(s) shall be clearly staked and/or flagged prior to any commencement of operations. No equipment or vehicle use shall be allowed outside the staked disturbance corridor of the pipeline ROW unless authorized by BLM personnel.

The upgraded 12-inch gas pipeline shall be buried along the north side of the Riley Gulch Road within a new surface disturbance corridor that shall not exceed 15 feet in width unless otherwise directed by the Authorized Officer. Topsoil shall be windrowed along the edge of the staked corridor for later re-use during the pipeline reclamation. Efforts shall be made during pipeline trenching to protect the culvert inlets and maintain the operation of existing road culverts. The existing Riley Gulch Road corridor shall be used as working space for the buried pipeline installation provided that the roadway shall remain passable for traffic.

Prior to pad expansion work commencing, the pipeline risers located on the GM 32-4 pad (near Corner 6) shall be identified for re-location or isolation from the construction work.

C. Welding of Pipeline. Visual inspections shall be performed on 100% of all pipeline welds. All welders shall be appropriately certified. (43CFR109.227) *Qualification of welders.* 49CFR192.241) *Inspection and test of welds.*

- (a) Welding must be performed by a qualified welder in accordance with welding procedures qualified under section 5 of API 1104 (incorporated by reference, *see* §192.7) or section IX of the ASME Boiler and Pressure Vessel Code “Welding and Brazing Qualifications” (incorporated by reference, *see* §192.7) to produce welds meeting the requirements of this subpart. The quality of the test welds used to qualify welding procedures shall be determined by destructive testing in accordance with the applicable welding standard(s).
- D. Pipeline Testing. The entire pipeline shall be tested in compliance with United States Department of Transportation (DOT) Code of Federal Regulations (CFR) (49 CFR Part 192). (Ref. 49 CFR 192.500.Subpart J entitled “Test Requirements”). (49CFR 192.225 Welding procedures.)
- E. Fire Suppression. Welding with acetylene or other open-flame torch shall be operated in an area barren or cleared of all flammable materials at least ten feet on all sides of equipment. Internal combustion engines must be equipped with approved spark arrestors which meet either (a) Department of Agriculture, Forest Service Standard 5100-1a, or (b) Society of Automotive Engineers (SAE) recommended practices J335(b) and J350(a).
- F. Saturated Soil Conditions. When saturated soil conditions exist on or along the proposed right-of-way, construction shall be halted until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils.
- G. Warning Signs. Pipeline warning signs shall be installed within 5 days of completion of construction and prior to use of the pipeline for transportation of product. Pipeline warning shall be installed at all road crossings and shall be visible from sign to sign along the ROW. For safety purposes each sign shall be permanently marked with the operator’s name and shall clearly identify the owner (emergency contact) and purpose (product) of the pipeline.
3. Special Status Plants. The following measures shall be implemented. Future botany surveys may be conducted at the appropriate time of year and under suitable climate conditions to determine presence or absence of DeBeque phacelia and Ute lady’s tresses. If these surveys are conducted to the CRVFO standards and determine that these species are not present within delineated suitable and marginally suitable habitats, then the following mitigation requirements shall be lifted.

The Operator shall incorporate the following steps to avoid and minimize impacts to DeBeque phacelia:

- a. No new surface disturbing activities shall occur within 20 meters of delineated suitable habitat.
- b. Surface disturbing activities located between 20 meters and 100 meters of delineated suitable habitat shall have dust control measures implemented. No adjuvants shall be added to water applied to the ground surface to control dust within this buffer.
- c. Weed control shall be limited to manual treatments only within 20 meters of delineated suitable habitat. A signed Pesticide Use Proposal (PUP) which identifies sensitive area protections shall be obtained from the BLM prior to any chemical treatments of weeds between 20 and 100 meters of delineated suitable habitat. Chemical weed treatment within this buffer shall be limited to spot spraying only.

The Operator shall incorporate the following steps to minimize negative impacts to marginally suitable habitat for Ute lady’s tresses:

- A. Where feasible, the extent of encroachment into the Riley Gulch riparian corridor shall be minimized.
- B. Water runoff from the GM 32-4 pad shall be managed to avoid siltation and maintain the existing water quality and hydrology in Riley Gulch.
- C. Surface disturbing activities located between 20 meters and 100 meters of marginally suitable habitat shall have dust control measures implemented. No adjuvants shall be added to water applied to the ground surface to control dust within this buffer.

BUREAU OF LAND MANAGEMENT

Colorado River Valley Field Office
2300 River Frontage Road
Silt, CO 81652

DOWNHOLE CONDITIONS OF APPROVAL
Applications for Permit to Drill

Operator: WPX Energy Rocky Mountain, LLC
Lease number: COC24603
Pad(s): GM32-4
Surface Location: Garfield County; SWNE, Sec. 4 T7S R96W
Engineer: Shauna Kocman

See list of wells following the COAs.

1. Twenty-four hours *prior* to (a) spudding, (b) conducting BOPE tests, (c) cementing/running casing strings, and (d) within 24 hours *after* spudding, the CRVFO shall be notified. One of the following CRVFO inspectors shall be notified by phone. The contact number for all notifications is: 970-876-9064. The BLM CRVFO inspectors are Julie King, Lead PET; David Giboo, PET; Greg Rios, PET; Tim Barrett, PET; Alex Provstgaard, PET; Brandon Jamison, PET.
2. A CRVFO petroleum engineer shall be contacted for a verbal approval prior to commencing remedial work, plugging operations on newly drilled boreholes, changes within the drilling plan, sidetracks, changes or variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Contact Shauna Kocman or Peter Cowan for verbal approvals (contact information below).
3. If a well control issue or failed test (e.g. kick, blowout, water flow, casing failure, or a bradenhead pressure increase) arises during drilling or completions operations, Shauna Kocman or Peter Cowan shall be notified within 24 hours from the time of the event. IADC/Driller's Logs and Pason Logs (mud logs) shall be forwarded to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 24 hours of a well control event.
4. The BOPE shall be tested and conform to Onshore Order No. 2 for a **10M** system and recorded in the IADC/Driller's log. A casing head rated to 10,000 psi or greater shall be utilized.
5. Flexible choke lines shall meet or exceed the API SPEC 16C requirements. Flexible choke lines shall be effectively anchored, have flanged connections, and configured to the manufacturer's specifications. Manufacturer specifications shall be kept with the drilling rig at all times and immediately supplied to the authorized officer/inspector upon request. Specifications at a minimum shall include acceptable bend radius, heat range, anchoring, and the working pressure. All flexible choke lines shall be free of gouges, deformations, and as straight/short as possible.
6. An electrical/mechanical mud monitoring equipment shall be function tested prior to drilling out the surface casing shoe. As a minimum, this equipment shall include a trip tank, pit volume totalizer, stroke counter, and flow sensor.
7. Prior to drilling out the surface casing shoe, gas detecting equipment shall be installed in the mud return system. The mud system shall be monitored for hydrocarbon gas/pore pressure changes, rate of penetration, and fluid loss.

8. A gas buster shall be functional and all flare lines effectively anchored in place, prior to drilling out the surface casing shoe. The discharge of the flare lines shall be a minimum of 100 feet from the wellhead and targeted at bends. The panic line shall be a separate line (not open inside the buffer tank) and effectively anchored. All lines shall be downwind of the prevailing wind direction and directed into a flare pit, which cannot be the reserve pit. The flare system shall use an automatic ignition. Where noncombustible gas is likely or expected to be vented, the system shall be provided supplemental fuel for ignition and maintain a continuous flare.
9. After the surface casing is cemented, a Pressure Integrity Test/Mud Equivalency Test/FIT shall be performed on the first well drilled in accordance with OOGO No. 2; Sec. III, B.1.i. to ensure that the surface casing is set in a competent formation. This is not a Leak-off Test, but a formation competency test, insuring the formation at the shoe is tested to the highest anticipated mud weight equivalent necessary to control the formation pressure to the next casing shoe depth or TD. Submit the results from the test via email skocman@blm.gov on this horizontal well and record results in the IADC log. Report failed test to Shauna Kocman or Peter Cowan. A failed pressure integrity test is more than 10% pressure bleed off in 15 minutes.
10. As a minimum, cement shall be brought to 200 feet above the Mesaverde. After WOC for the production casing, a CBL shall be run to verify the TOC and an electronic copy in .las and .pdf format shall be submitted to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 48 hours. If the TOC is lower than required or the cement sheath of poor quality, a CRVFO petroleum engineer shall be notified for remedial operations within 48 hours from running the CBL and prior to commencing fracturing operations.

A greater volume of cement may be required to meet the 200-foot cement coverage requirement for the Williams Fork Formation /Mesaverde Group. Evaluate the top of cement on the first cement job on the pad (Temperature Log). If cement is below 200-foot cement coverage requirement, adjust cement volume to compensate for low TOC/cement coverage.
11. On the first well drilled on this pad, a triple combo open-hole log shall be run from the base of the surface borehole to surface and from TD to bottom of surface casing shoe. This log shall be in submitted within 48 hours in .las and .pdf format to: CRVFO – Todd Sieber, 2300 River Frontage Road, Silt, CO 81652. Contact Todd Sieber at 970-876-9000 or asieber@blm.gov for clarification.
12. Submit the (a) mud/drilling log (e.g. Pason disc), (b) driller's event log/operations summary report, (c) production test volumes, (d) directional survey, and (e) Pressure Integrity Test results within 30 days of completed operations (i.e. landing tubing) per 43 CRF 3160-9 (a).
13. Prior to commencing fracturing operations, the production casing shall be tested to the maximum anticipated surface treating/fracture pressure and held for 15 minutes without a 2% leak-off. If leak-off is found, Shauna Kocman or Peter Cowan shall be notified within 24 hours of the failed test, but prior to proceeding with fracturing operations. The test shall be charted and set to a time increment as to take up no less than a quarter of the chart per test. The chart shall be submitted with the well completion report.
14. During hydraulic frac operations, monitor the bradenhead/casing head pressures throughout the frac job. Frac operations shall be terminated upon any sharp rise in annular pressure (+/- 40 psi or greater) in order to determine well/wellbore integrity. Notify Shauna Kocman or Peter Cowan immediately.
15. Per 43 CFR 3162.4-1(c), no later than the 5th business day after any well begins production on which royalty is due anywhere on a lease site or allocated to a lease site, or resumes production in a case of a well which has been off production for more than 90 days, the operator shall notify the authorized officer by letter or sundry notice, Form 3160-5, or orally to be followed by a letter or sundry notice, of the date on which such production has begun or resumed.

Contact Information

Shauna Kocman, PhD, PE
Petroleum/ Environmental Engineer

Office: (970) 876-9061
Cell: (970) 456-5602
skocman@blm.gov

Peter Cowan
Petroleum Engineer

Office: (970) 876-9049
Cell: (970) 309-8548
picowan@blm.gov

List of Wells			
<i>Proposed Pads</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
GM 32-4	GM 702-4-HN1	SWNE, Sec. 4 T7S R96W	SWNE Sec. 9 T7S R96W

Left blank for two-sided copying.

FONSI

DOI-BLM-CO-N040-2013-0067-EA

The Environmental Assessment (EA) analyzing the environmental effects of the Proposed Action has been reviewed. The project design and approved mitigation measures result in a Finding of No Significant Impact (FONSI) on the human environment. Therefore, an Environmental Impact Statement (EIS) is not necessary to further analyze the environmental effects of the Proposed Action.

DECISION RECORD

DECISION: It is my decision to approve the Proposed Action as described and analyzed in this EA. This decision would provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources on a valid Federal oil and gas lease.

RATIONALE: The bases for this decision are as follows:

1. Approval of the Proposed Action is validating the rights granted with the Federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.
2. The environmental impacts would be avoided, minimized, or offset with the mitigation measures incorporated into the Proposed Action or attached and enforced by BLM as Conditions of Approval (COAs).
3. This Decision does not authorize the initiation of surface-disturbing activities on BLM lands or of drilling activities associated with any Federal oil and gas well. Initiation of activities related to the new Federal oil and gas wells to be added to the existing well pad may commence only upon approval by BLM of the Application for Permit to Drill (APD).

MITIGATION MEASURES: The COAs presented in Appendix A of the attached EA would be attached to any and all APDs approved by the BLM for Federal oil and gas wells on the GM 32-4 well pad as part of the Proposed Action.

NAME OF PREPARER: Jim Byers, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:



Allen B. Crockett, Ph.D., J.D.
Supervisory Natural Resource Specialist

DATE:

June 4, 2013