

**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-N040-2012-0112-EA

CASEFILE NUMBER

Federal Oil and Gas Lease COC01523

PROJECT NAME

Proposal to Drill Seven Additional Wells into Federal Lease COC01523 from the Existing PA-29 Pad Located on BLM land in the South Parachute area, Garfield County, Colorado.

PAD LOCATION

Township 7 South (T7S), Range 95 West (R95W), Section 29, Lot 1, Sixth Principal Meridian

APPLICANT

Encana Oil & Gas (USA) Inc. Contact: Jevin Croteau, 370 Seventeenth Street, Suite 1700, Denver, Colorado 80202.

PROPOSED ACTION

Encana Oil and Gas Inc. (Encana) proposes to drill and develop up to seven Federal oil and gas wells from one existing well pad, the PA-29, located in the South Parachute Field, Garfield County, Colorado (Figure 1). The existing PA-29 well pad is located on Federal surface with underlying Federal minerals and currently supports three producing Federal wells and one producing fee well. The new wells would be directionally drilled from the PA-29 well pad (Figure 2). Accommodating these additional wells would require expansion of the pad by 3.5 acres from its current interim-reclaimed condition of 1.2 acres to a new total surface disturbance of approximately 4.7 acres (Figure 3). Of the 3.5 acres of expanded area, 2.6 acres was previously disturbed prior to interim reclamation. Following completion on the last of the seven new wells on the pad, interim reclamation would reduce the total disturbed area of 4.7 acres to a long-term working area of 1.6 acres (Figure 4). Names and locations of the wells are presented in Table 1. Encana plans to start drilling these wells in September 2013.

The existing access road and pipelines would continue to serve the PA-29 pad without the need for modification. In addition to the use of these existing components, Encana proposes to install two 8-inch temporary surface poly water lines (8,524 feet), and one 5.5-inch P110 steel temporary surface frac line for delivering water used in hydraulic fracture stimulation (8,920 feet) (Figures 5 and 6). The temporary surface pipelines, used to deliver fresh water to the PA-29 pad for drilling and completion activities, would be laid parallel to existing road and pipeline right-of-ways.

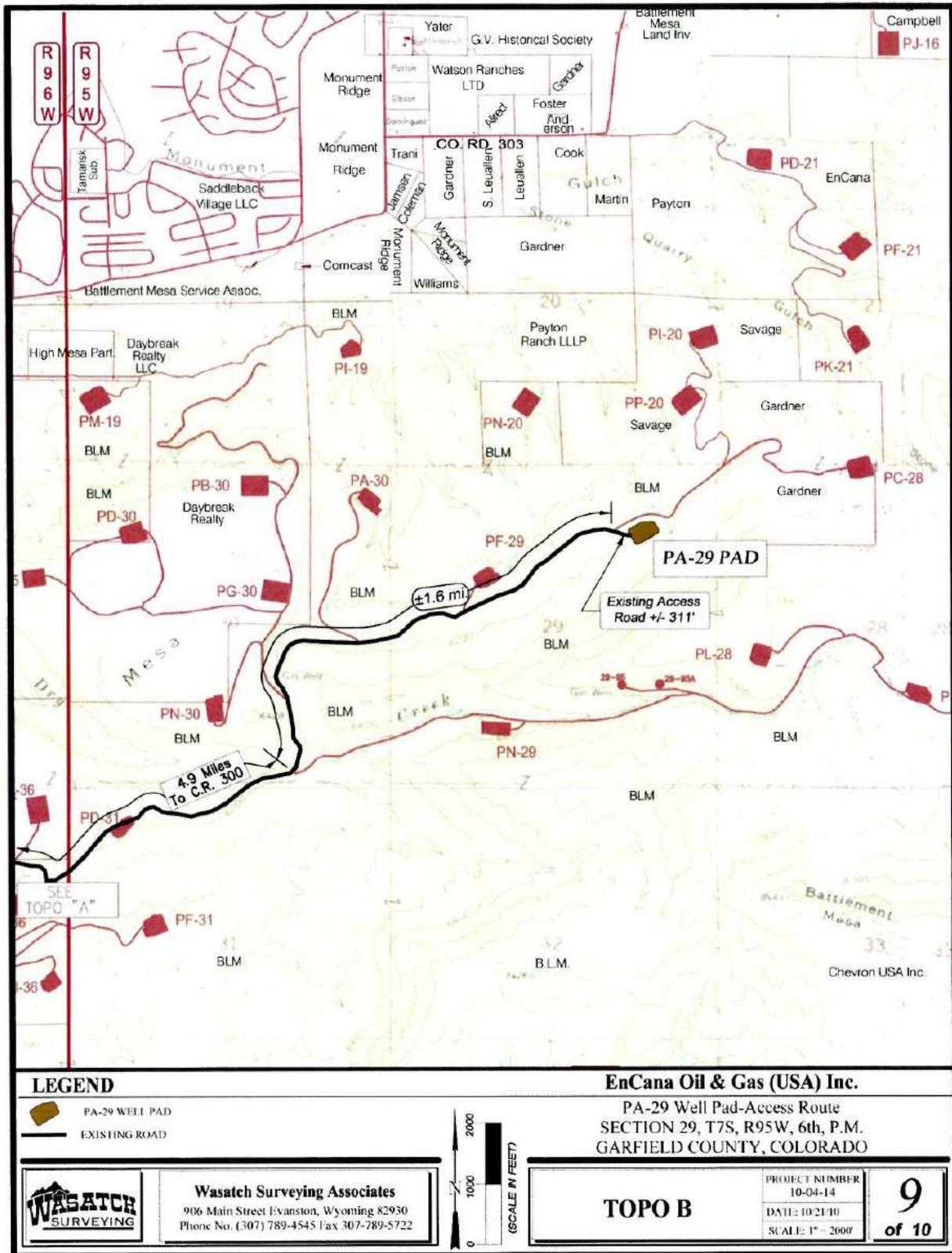


Figure 1. Project Location Map and Access Route

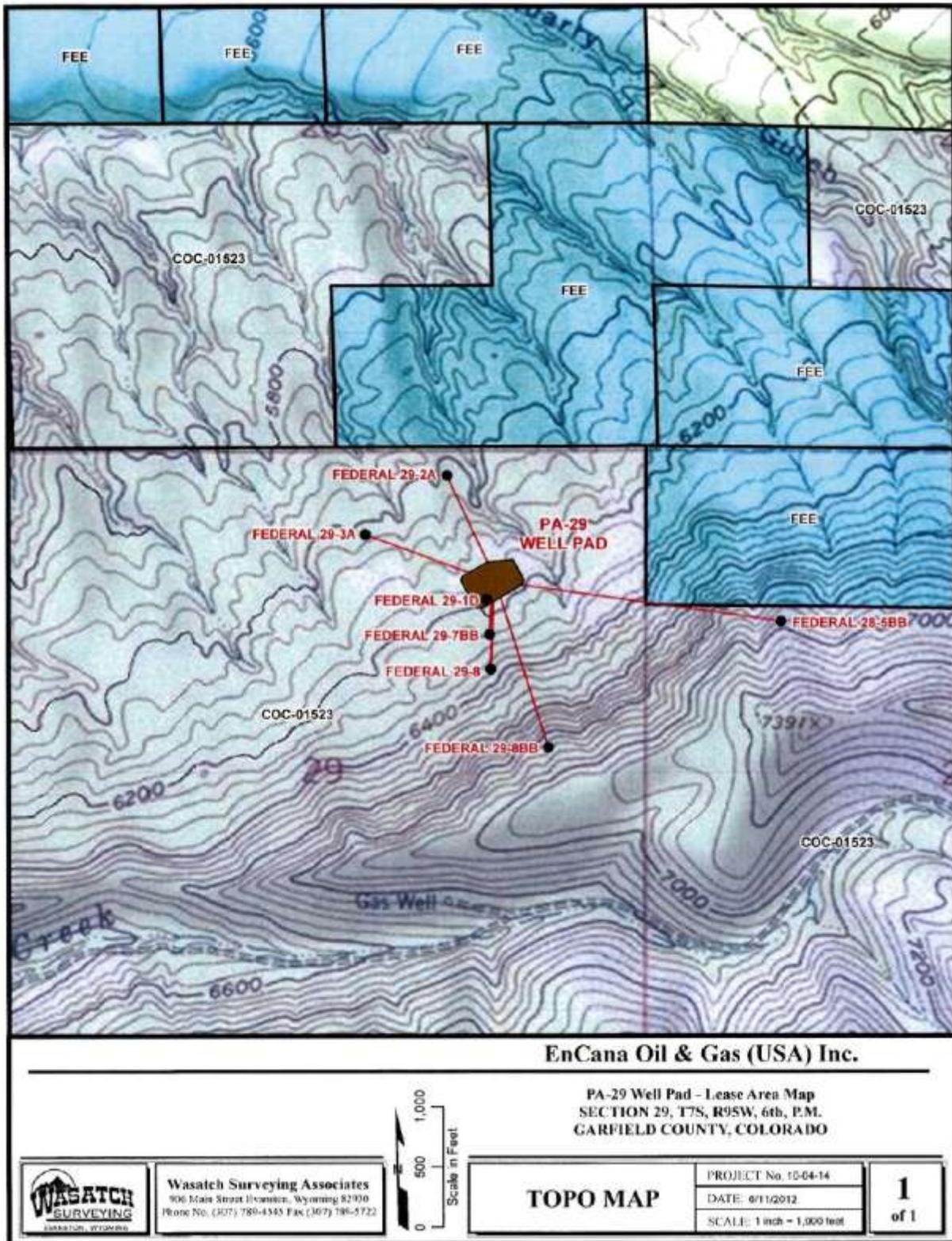


Figure 2. Project Surface and Mineral Ownership

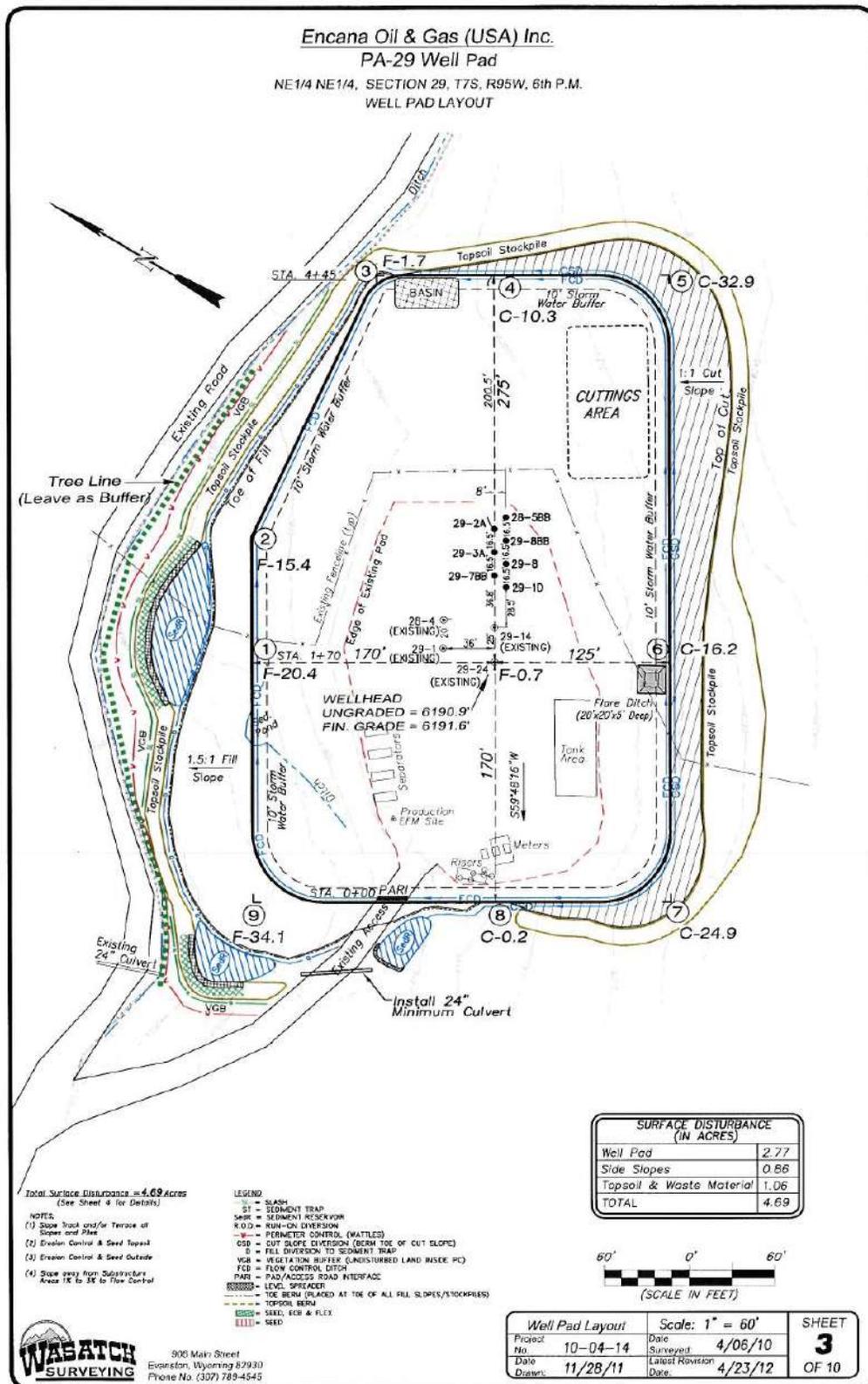


Figure 3. PA-29 Well Pad Construction Layout

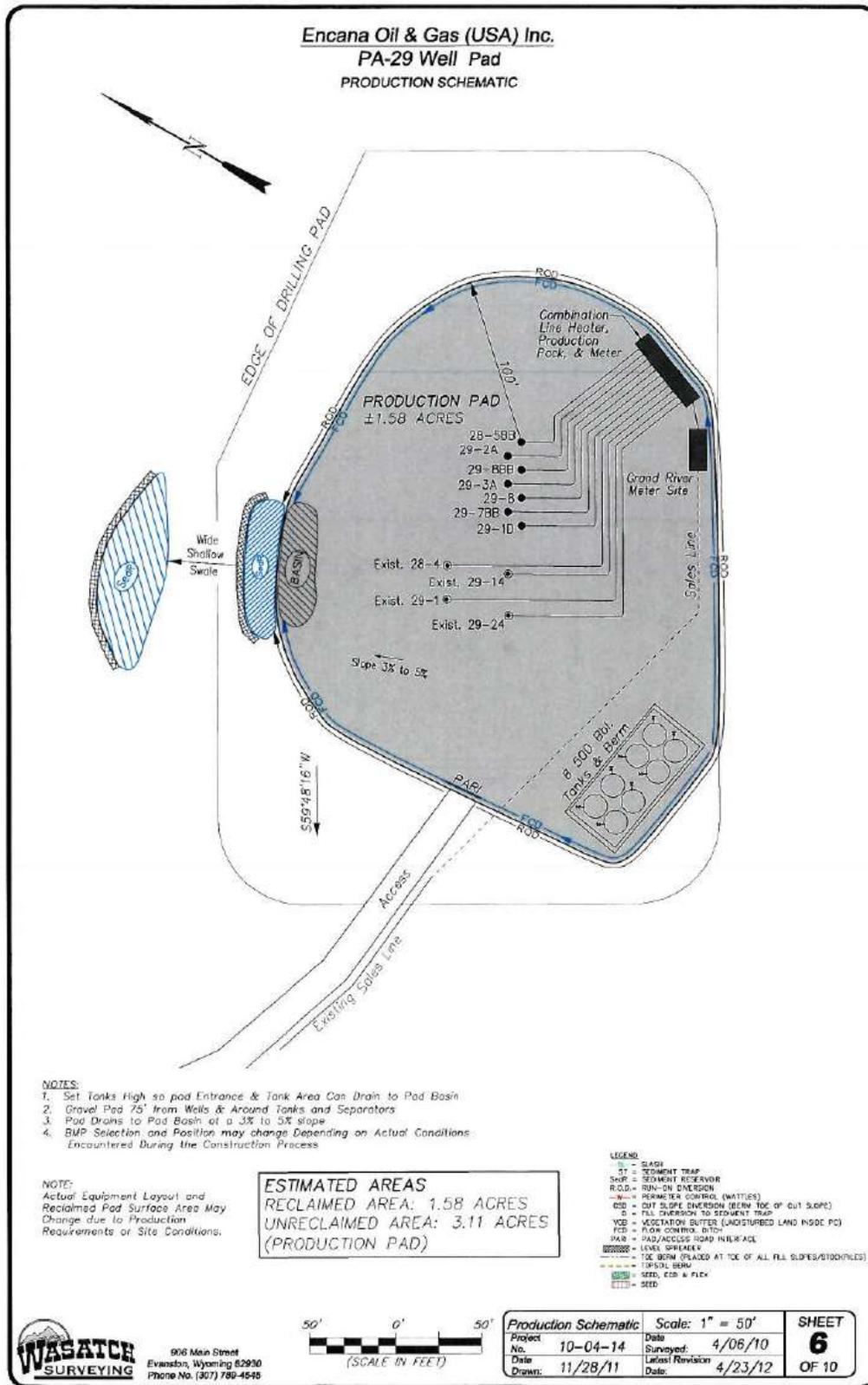


Figure 4. Production Schematic

Table 1. Surface and Bottomhole Locations of Proposed Federal Wells			
<i>Proposed Wells</i>	<i>Federal Lease</i>	<i>Surface Location</i>	<i>Bottomhole Location</i>
Federal 28-5BB (PA-29)	COC01523 (BH)	1123 feet FNL, 1087 feet FEL Lot 1, Section 29, T7S R95W	1459 feet FNL, 1230 feet FWL SW ¹ / ₄ NW ¹ / ₄ , Section 29, T7S R95W
Federal 29-1D (PA-29)	COC01523 (BH)	1148 feet FNL, 1129 feet FEL Lot 1, Section 29, T7S R95W	1278 feet FNL, 1193 feet FEL Lot 1, Section 29, T7S R95W
Federal 29-2A (PA-29)	COC01523 (BH)	1120 feet FNL, 1098 feet FEL Lot 1, Section 29, T7S R95W	248 feet FNL, 1523 feet FEL Lot 2, Section 29, T7S R95W
Federal 29-3A (PA-29)	COC01523 (BH)	1128 feet FNL, 1112 feet FEL Lot 1, Section 29, T7S R95W	739 feet FNL, 2197 feet FEL Lot 2, Section 29, T7S R95W
Federal 29-7BB (PA-29)	COC01523 (BH)	1137 feet FNL, 1129 feet FEL Lot 1, Section 29, T7S R95W	1572 feet FNL, 1171 feet FEL SE ¹ / ₄ NE ¹ / ₄ , Section 29, T7S R95W
Federal 29-8 (PA-29)	COC01523 (BH)	1139 feet FNL, 1115 feet FEL Lot 1, Section 29, T7S R95W	1862 feet FNL, 1160 feet FEL SE ¹ / ₄ NE ¹ / ₄ , Section 29, T7S R95W
Federal 29-8BB (PA-29)	COC01523 (BH)	1131 feet FNL, 1101 feet FEL Lot 1, Section 29, T7S R95W	2513 feet FNL, 680 feet FEL SE ¹ / ₄ NE ¹ / ₄ , Section 29, T7S R95W

The source of water for drilling and completion operations would be from Encana’s High Mesa water facility. Water would be transported to the PA-29 pad from the High Mesa water facility through an existing water line to the west of the pad from either the existing “Presco” pipeline or the Encana PB30 remote frac pad. The proposed poly water lines would transport water from the “Presco” pipeline, and the proposed P110 steel frac line would transport water from the PB30 remote frac pad. The proposed lines would be removed within two months following completion operations. No new surface disturbance would occur as a result of the installation of the temporary lines.

A closed-loop drill system would be used on the pad, eliminating the need for a fluids-containing reserve pit. Recovered drilling fluid would be stored on location in steel tanks for reuse. Drill cuttings would be collected and contained in a constructed mixing area, with a berm, during drilling operations. Cuttings would be deposited in a small lined pit at the edge of the pad and would be solidified after the drill rig has moved off the location. The cuttings pit would be constructed to be capable of holding approximately two times the calculated volume to be generated. Cuttings would be mixed with drying agents and stored at the cut slope. After drilling and completion, cuttings would be used in interim reclamation of the pad.

NO ACTION ALTERNATIVE

The No Action Alternative would constitute denial of the Federal APD(s) described in the Proposed Action, meaning that none of the proposed Federal wells would be drilled. Although the BLM cannot deny the right to drill and develop the Federal oil and gas lease, individual APDs can be denied to prevent unnecessary and undue degradation.

The No Action Alternative constitutes denial of the Federal APD(s) described in the Proposed Action. Consequently, none of the planned development activities outlined in the Proposed Action would occur. However, in the event that the No Action Alternative were selected by the BLM as an outcome of the EA process, Encana would probably drill from a different location to avoid the BLM surface described in the Proposed Action.

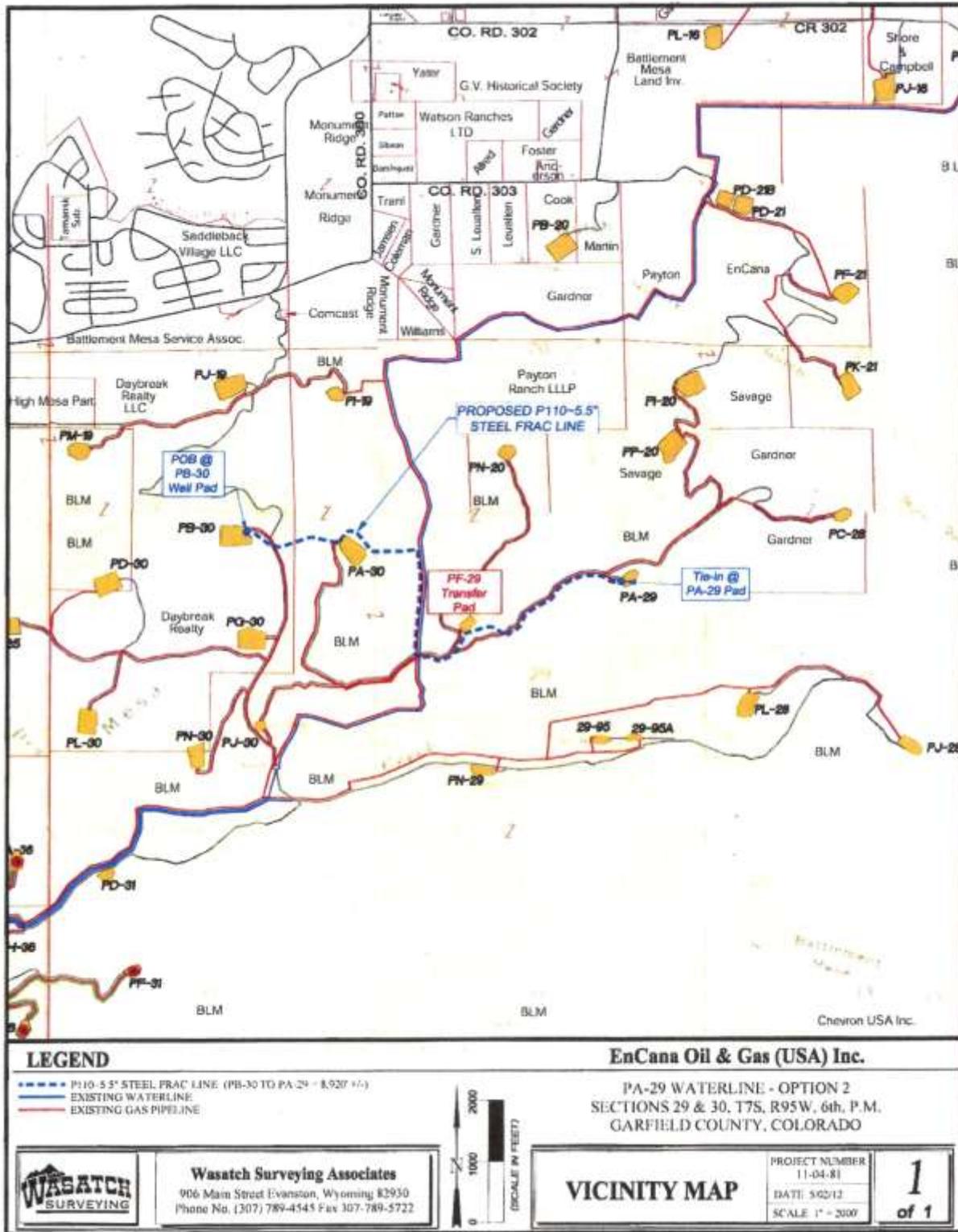


Figure 5. PA-29 Proposed Temporary Surface Steel Frac Lines

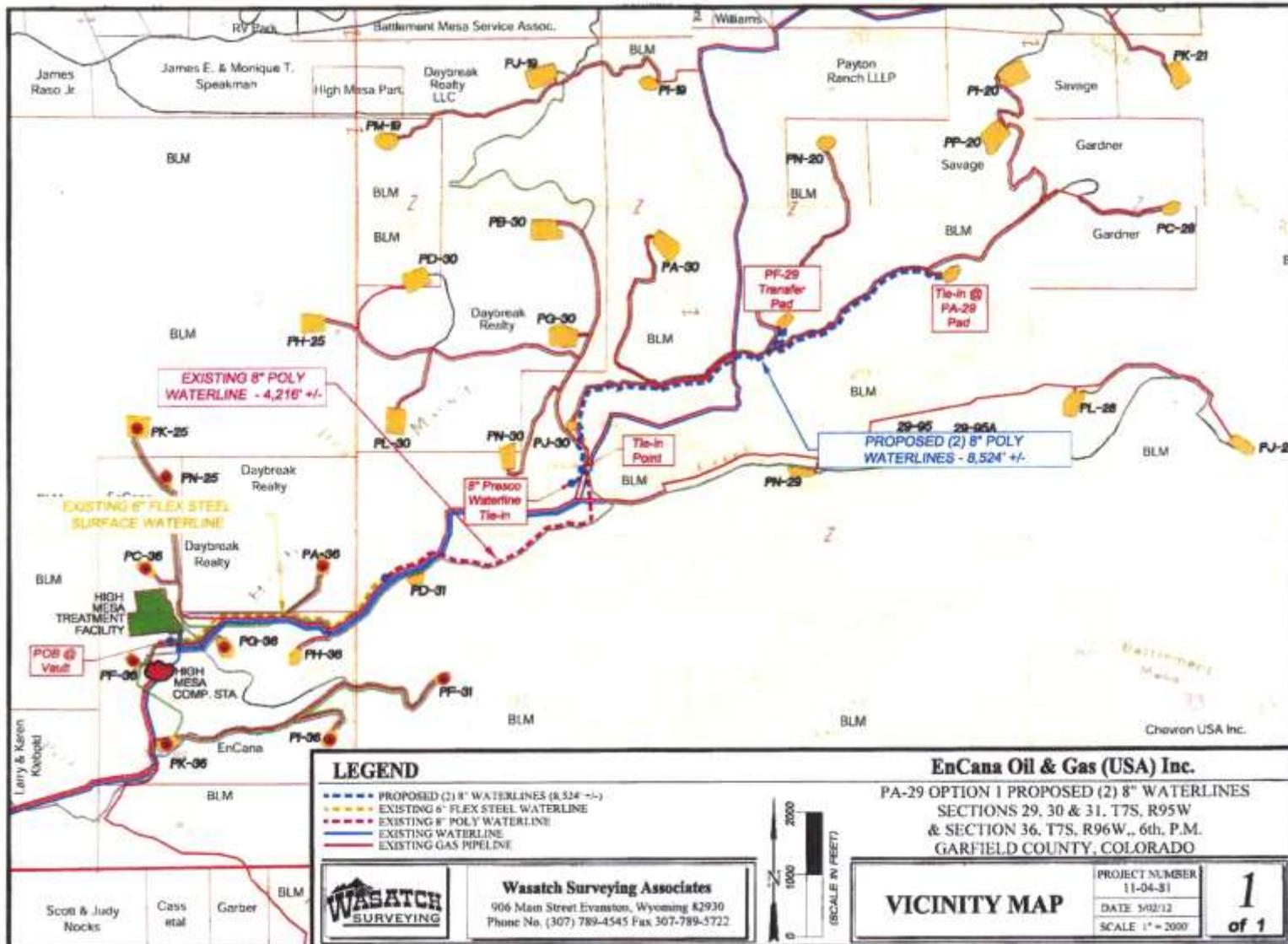


Figure 6. PA-29 Proposed Temporary Surface Poly Water Lines

PURPOSE AND NEED FOR THE ACTION

The purpose of the Proposed Action is to develop oil and gas resources on Federal lease COC01523 consistent with existing Federal lease rights. The action is needed to increase the development of oil and gas resources for commercial marketing to the public.

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): “In areas being actively developed, the operator must submit a Geographic Area Proposal (GAP) [currently referred to as a Master Development Plan, MDP] that describes a minimum of 2 to 3 years of activity for operator controlled leases within a reasonable geographic area.”

Discussion: The Proposed Action is in conformance with the 1991 and 1999 RMP amendments cited above because the Federal mineral estate proposed for development is open to oil and gas leasing and development. 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. However, the 1999 RMP amendment also provides exceptions to that requirement for individual or small groups of exploratory wells drilled in relatively undrilled areas outside known high production areas. The Proposed Action is therefore in conformance with the exception to the requirement to require operators to submit GAPs/MDPs.

BACKGROUND

The PA-29 well pad currently proposed as the location for seven new Federal oil and gas wells was originally analyzed and approved in Environmental Assessment (EA) #CO140-1998-087, signed in May 1999 (BLM 1999c). The existing PA-29 well pad is located on Federal surface with underlying Federal minerals, and currently supports three producing Federal wells and one producing fee well. The addition of six Federal wells on the PA-29 pad was analyzed as part of the South Parachute Geographic Area Plan (SPGAP) approved as EA #CO140-2006-050 in August 2007 (BLM 2007). At this time, none of the six Federal wells analyzed in the SPGAP has been permitted; three of the seven wells in the current proposal were among the six wells analyzed under the SPGAP.

The proposal by Encana for the addition of seven new Federal wells to the existing PA-29 pad would normally be analyzed and, if appropriate, approved using a Categorical Exclusion available under Section 390 of the Energy Policy Act of 2005, which allows approval of oil and gas projects without additional analysis under the National Environmental Policy Act (NEPA) under certain specific conditions.

Specifically in this case, use of Section 390 CX Category 1 would normally apply because of consistency with its provisions:

Individual surface disturbances of less than five (5) acres so long as the total surface disturbance on the lease is not greater than 150 acres and site-specific analysis in a document prepared pursuant to NEPA has been previously completed.

However, the BLM has concluded that preparation of a new EA tiered to the SPGAP (CO140-2006-050-EA)(BLM 2007) was appropriate because impacts analyzed and disclosed for some of the resources and resource uses addressed in the earlier EA. In general, this determination was based on the additional development of additional wells across a greater duration than analyzed previously. Consequently, the BLM has prepared this EA using the tiering process outlined in 40 CFR 1502.20. This provision encourages Federal agencies to tier new NEPA documents to previously completed documents, when appropriate, for the purposes of eliminating repetitive discussions and focusing on natural and human environment elements present in the project vicinity and potentially affected by the project. This provision applies, because most aspects and potential impacts of the project would remain the same as or not significantly different from those analyzed and disclosed in the SPGAP and thus do not warrant additional, repetitive analysis and documentation.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

During its internal scoping process for the current Proposed Action, CRVFO resource specialists evaluated the Proposed Action in relation to current resource conditions. This evaluation indicated that 11 resources and resource uses could be impacted differently, or to a different extent, than analyzed and disclosed in the SPGAP (EA #CO140-2006-050) (BLM 2007) to which the current EA is tiered. The resources and resource uses identified as requiring additional analysis are as follows:

Air Quality	Vegetation
Invasive Non-Native Plants	Visual Resources
Geology	Wastes, Hazardous or Solid
Migratory Birds	Water Quality - Surface
Noise	Wildlife - Terrestrial and Aquatic
Special Status Species	

For the remaining resources and uses, evaluation of the current Proposed Action indicated that the initial analysis in the SPGAP (BLM 2007) remained adequate despite the small area of new disturbance and drilling of a small number of additional wells. These remaining resources include Access and Transportation, Cultural Resources, Fossil Resources, Native American Religious Concerns, Soils, Socioeconomics, and Groundwater Quality), the impact analyses in analogous sections of the SPGAP (EA #CO140-2006-050) (BLM 2007) are incorporated by reference.

Resource surveys, including those for cultural resources, nesting raptors, and special status plants and animals, were completed in conjunction with the 2007 EA. A new raptor survey would be conducted prior to construction or drilling associated with the current Proposed Action.

No specific stipulations (other than standard stipulations) are attached to Federal lease. The COAs presented in Appendix A would be attached to APDs for the seven new Federal wells to avoid, minimize, or offset adverse impacts as a result of implementing the Proposed Action.

Access and Transportation

Impacts to access and transportation were adequately analyzed in the SPGAP (BLM 2007), incorporated here by reference.

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 March 2012 confirms continuing attainment of the CAAQS and NAAQS (Garfield County 2012). Federal air quality regulations are enforced by the CDPHE. The Prevention of Significant Deterioration (PSD) program within CDPHE is designed to limit incremental increases for specific air pollutant concentrations above a legally defined baseline level, as defined by an area's air quality classification. Incremental increases in PSD Class I areas are strictly limited.

Federal air quality regulations adopted and enforced by CDPHE limit incremental emissions increases to specific levels defined by the classification of air quality in an area. The PSD Program is designed to limit the incremental increase of specific air pollutant concentrations above a legally defined baseline level. 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).

Environmental Consequences

Proposed Action

The CDPHE, under 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 conjunction with industrial developments and other air pollution sources in Colorado. Unlike the conceptual "reasonable but conservative" engineering designs

used in NEPA analyses, any 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 PA-29 project includes constructing, drilling, completing, and operating up to 7 new federal wells and disturbing 3.5 additional acres of surface for the pad expansion. Although the impacts to air quality from these wells are disclosed in this EA, the drilling and operation is permitted with the approval of an APD for each well. Individual wells would require approximately 7 to 10 days to drill and approximately 5 to 15 days to complete. Air quality would decrease during construction of access roads, pads, and pipelines and drilling and completing the wells.

Pollutants generated during construction activities would include combustion emissions and fugitive dust associated (PM₁₀ and PM_{2.5}) with earthwork and construction equipment. 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. 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 completions equipment. Fugitive dust and vehicle emissions from mobilization of equipment necessary for the drilling and completions phase, 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. At the completion of these phases, emissions associated with drilling and completing the wells would also be greatly reduced to emissions associated with long-term natural gas and condensate production.

A regional air model addressing air quality impacts of current and future oil and gas activities within the CRVFO has recently been completed for the BLM by Tetra Tech, Inc. and its subcontractor, URS Corporation. The model addressed the cumulative impacts of incremental oil and gas development in the modeling domain by assuming a range of BLM wells and associated infrastructure and mitigation scenarios. A total of 2,664 wells were modeled in the "no action" scenario in which no additional mitigations above meeting CDPHE and EPA regulations and emissions standards were modeled. Within the range of alternatives a total of 4,198 new BLM wells and the associated facilities and infrastructure including were modeled requiring air quality mitigations in addition to the CDPHE and EPA regulations and emissions standards. In all scenarios analyzed in the ARTSD, the air analysis shows that impacts to air quality from the proposed BLM levels of development are estimated to be below NAAQS, CAAQS, PSD increments, and visibility and deposition thresholds. In addition, the cumulative impacts of all oil and gas development in conjunction with other major emissions sources were evaluated by assuming 15,664 future wells and a cumulative total of over 44,000 wells within the modeling domain over the next twenty years. The methods and results of that modeling are presented in an Air Resources Technical Support Document (ARTSD) (BLM 2011).

The air quality model addressed impacts associated with emissions of greenhouse gases (GHGs), "criteria pollutants" (CO, NO₂, SO₂, ozone, PM₁₀, and PM_{2.5}), hazardous air pollutants (HAPs) including BTEX (benzene, ethylbenzene, toluene, and xylenes), formaldehyde, and n-hexane. The modeling 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. The visibility analysis predicted a slight impact (one 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 air quality model incorporated assumptions about various development and mitigation scenarios, many of which have been integrated into the Proposed Action or would be imposed by the BLM as COAs (Appendix A). 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 be further reduced by BLM's requirement that the operator 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 dust suppressant surfactant approved by the BLM throughout the long-term production phase (Appendix A).

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, BBC 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.

The recent air modeling for the CRVFO inventoried and assessed GHG emissions associated with various scenarios of future oil and gas development. In all scenarios modeled, the GHG emissions would not increase the total U.S. natural gas sector emissions by more than 0.5%. 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.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled.

Cultural Resources

Impacts to cultural resources were adequately analyzed in the SPGAP (BLM 2007), incorporated here by reference.

Geology

In general, impacts to geologic resources were adequately analyzed in the SPGAP (CO140-2006-050-EA). The analogous section of that EA is incorporated here by reference and relevant COAs retained (Appendix A). However, the CRVFO has recently begun incorporating information on potential impacts of hydraulic fracture stimulation (“fracing”) as a result of microseismic events and the lateral and vertical extent of induced fractures. This new information is presented below.

Environmental Consequences

Proposed Action

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 noted above 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 2). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 2 may or may not be used, and the information is provided solely as general information. Although a variety of chemicals additives are used in hydraulic fracturing—the examples in Table 5 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 2. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

Table 2. 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

Following hydraulic fracturing, 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.

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 well pad would not be expanded and no new wells would be drilled, resulting in no new impacts to air quality.

Invasive Non-Native Plants

Affected Environment

The general project area lies within pinyon-juniper habitat at an elevation of approximately 6,800 feet. Original construction of the PA-29 well pad disturbed a total of approximately 3.8 acres, of which 3 acres was seeded with a standard reclamation seed mix of native species in 2007. Three species of state listed noxious weeds occur on the site, including one List B species, musk thistle (*Carduus nutans*), and two List C species, cheatgrass (*Bromus tectorum*) and field bindweed (*Convolvulus arvensis*). Other invasive Non-native species occurring here include Russian-thistle (*Salsola tragus*), kochia (*Bassia scoparia*), prickly lettuce (*Lactuca serriola*), salsify (*Tragopogon dubius*), and yellow sweetclover (*Melilotus officinale*), and. Non-native grass species are also present, including crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Thinopyrum intermedium*), and orchardgrass (*Dactylis glomerata*).

Within the 0.9 acre area proposed for new disturbance, the vegetation consists of native trees, shrubs, forbs, and grasses. Biological soil crusts of mosses and lichens are common on the soil surface. Due to the well-established native plant community and biological soil crusts, noxious weeds are currently absent from the undisturbed portion of the project area.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 3.5 acres would be disturbed. Of this area, 2.6 acres were previously disturbed and currently under temporary reclamation, with 0.9 acre of first-time disturbance. An additional 1.2 acres remains in a disturbed status from the initial pad construction and is maintained as the working pad surface. This area of long-term disturbed working area would increase to 1.6 acres.

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 production activities require construction equipment and motorized vehicles, which often transport invasive plant seeds either alone or in mud clods on the 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 most of the project area has already been disturbed, including the existing pad surface and the reclaimed area, and because noxious weeds and other invasive, non-native species are currently present on the site, the potential for increased establishment of these undesirable plants following construction activities is high. Movement of soil by construction equipment would be expected to spread weed seeds throughout the project area, and the total area of disturbed habitat would increase. 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 would also be attached to APDs to require seeding with an appropriate native seed mix and monitoring of reclamation seeding results (Appendix A).

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled, resulting in no additional risk of invasion by undesirable non-native species.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) includes native passerines (flycatchers and songbirds) as well as birds of prey, migratory waterbirds (waterfowl, wading birds, and shorebirds), and other species such as doves, hummingbirds, swifts, and woodpeckers. Within the context of the MBTA, “migratory” birds include non-migratory “resident” species as well as true migrants, essentially encompassing virtually all native bird species. For most migrant and resident species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of both nesting sites and food. In addition, because birds are generally territorial during the nesting season, their ability to access and utilize sufficient food is limited by the quality of the territory occupied. During non-breeding seasons, birds are generally non-territorial and able to feed across a larger area and wider range of habitats.

Several migratory bird species occupy, or have the potential to occupy, the project area. Migratory bird species that are Federally listed under the Endangered Species Act of 1973, as amended, or classified by

the BLM as sensitive species, are addressed under the section on Special Status Species. Emphasizing the need to conserve declining species, the U.S. Fish and Wildlife Service (USFWS) has published a list of Birds of Conservation concern (BCC) that warrant prompt conservation attention to stabilize or increase populations or to secure threatened habitats (USFWS 2008). This analysis focuses on BCC species, non-BCC species that are Neotropical migrants, and raptors—three groups highly vulnerable to habitat loss or modification on their breeding grounds.

Stands of pinyon and juniper provide some habitat for three pinyon-juniper obligate species on the BCC list: the pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus ridgwayi*), and gray vireo (*Vireo vicinior*). Of these, the last species is unlikely to occur because of the location of the project area outside the known nesting range, located farther to the west. Non-BCC migrants potentially occurring in the limited pinyon-juniper include the blue-gray gnatcatcher (*Poliophtila caerulea*) and black-throated gray warbler (*Setophaga nigrescens*). During winter, three additional non-BCC species—Clark’s nutcracker (*Nucifraga columbiana*), Townsend’s solitaire (*Myadestes townsendi*), and cedar waxwing (*Bombycilla cedrorum*)—may congregate in pinyon-juniper habitats in search of pine nuts (the nutcracker) or juniper berries (the solitaire and waxwing). Other migrants expected in sagebrush shrubland habitats include the western kingbird (*Tyrannus vociferus*), western meadowlark (*Sturnella neglecta*), vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*).

Raptors use the project area for nesting and hunting activities. Species most likely to nest within or near the project area and/or use the project vicinity for foraging include two BCC species—the golden eagle (*Aquila chrysaetos*) and prairie falcon (*Falco mexicanus*)—and, more commonly, non-BCC species such as the American kestrel (*Falco sparverius*), Cooper’s hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*). Another BCC species, the peregrine falcon (*Falco peregrinus*), nests on the Roan Cliffs of the CRVFO area but hunts primarily along major rivers and reservoirs or across the broad, rolling upland atop the Roan Plateau.

Environmental Consequences

Proposed Action

Under the Proposed Action, removal of 3.5 acres of pinyon-junipers and reclaimed grasses would result in loss of existing and potential nesting sites for perching birds. While habitat loss and fragmentation may affect individual birds, it is not expected to adversely impact a species as a whole. If construction, drilling, or completion activities occur during the nesting season, visual and noise disturbance near active nests could cause nest abandonment and failure, reducing the productivity of affected species. Construction activity during the nesting season could also result in the destruction of clutches and/or mortality of nestlings.

A Timing Limitation (TL) applied as a COA (Appendix A) would prohibit vegetation removal during the period May 1 to July 1 to reduce adverse impacts to migratory birds such as BCC species. A raptor nesting TL, described in Appendix A, would also preclude construction, drilling, or completion activities during the period May 1 to July 1 to minimize disturbance to nesting raptors. In addition to these restrictions, the operator is subject to the MBTA, administered by the USFWS, which precludes the “take” of any raptor or most other native species. Under the Act, the term “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The USFWS interprets “harm” and “kill” to include loss of eggs or nestlings due to abandonment or reduced attentiveness by one or both adults as a result of disturbance by human activity, as well as physical destruction of an occupied nest. The 60-day TL does not ensure compliance with the MBTA.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled, resulting in no new impacts to migratory birds.

Native American Religious Concerns

Impacts to Native American religious concerns were adequately analyzed in the SPGAP (BLM 2007), incorporated here by reference.

Noise

Affected Environment

The project area is located in a rural setting approximately 2.6 miles southeast of Parachute, Colorado and Interstate 70 (I-70). The project area is rural, and noise levels are presently created traffic on the county roads and oil and gas development.

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 (EPA 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. With the additional wells proposed under this Proposed Action, the duration of noise impacts would be greater than analyzed in the SPGAP (BLM 2007). 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 (Table 3) at a distance of 350 feet.

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 4), project-

related noise levels would be approximately 59 dBA at a distance of 1,000 feet, approximating active commercial areas (EPA 1974).

<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

<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	83	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 3 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 current oil and gas developments in the area. As stated above, the nearest residence is less than 0.25 mile away. 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 well pad would not be expanded and no new wells would be drilled, resulting in no additional noise impacts.

Soils

Impacts to soils were adequately analyzed in the SPGAP (BLM 2007), incorporated here by reference.

Special Status Species

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 5 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. There is no potential habitat for any Federally listed, proposed, or candidate plant species within or adjacent to the project area.

Table 5. 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	No	No
Colorado hookless cactus (<i>Sclerocactus glaucus</i>) – Threatened	Rocky hills, mesa slopes, and alluvial benches in salt desert shrub communities; often with well-formed microbial 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	No	No
Ute ladies'-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	No	No

Environmental Consequences

Proposed Action

Because no potential habitat for any Federally listed, proposed, or candidate plant species exists within or adjacent to the project area, there would be **No Effect** on any of these species.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. Therefore, there would be “**No Effect**” on any Federally listed, proposed, or candidate threatened or endangered plant species.

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 6 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 6. Potential for Occurrence of Threatened or Endangered Wildlife and Project Impacts				
<i>Species and Status</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
Canada lynx (<i>Lynx canadensis</i>) – Threatened	Expanses of subalpine and upper montane coniferous forests	Spruce-fir forests; also lodgepole pine and aspen	No	No
Greater sage-grouse (<i>Centrocercus urophasianus</i>) - Candidate	Large areas of contiguous sage-brush	Obligate users of several species of sagebrush with some seasonal variation.	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 within closed-canopy coniferous forests	No	No
Yellow-billed cuckoo (<i>Coccyzus americanus</i>) – Candidate	Colorado, Dolores, Yampa, Rio Grande, and North Fork of Gunnison rivers	Large cottonwood stands along rivers	No	No
Razorback sucker (<i>Xyrauchen texanus</i>) – Endangered	Occur in mainstem of the Colorado River and major tributary rivers – upstream to Rifle, Colorado, in the 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	Occur in mainstem of the Colorado River and major tributaries – upstream to Black Rocks near Utah line	Rocky runs, riffles, and rapids	No	Yes
Bonytail chub (<i>Gila elegans</i>) – Endangered		Shallow reaches of swift, deep rivers	No	Yes
Greenback cutthroat trout (<i>Oncorhynchus clarki stomias</i>) – Endangered	Native in South Platte drainage, recently documented in the CRVFO	Clear, cold mountain streams and headwaters lakes	No	No

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**” 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.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled therefore there would not be any additional impacts to Federally listed, proposed, or candidate threatened or endangered animal species.

BLM Sensitive Plant and Animal Species

PLANTS

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 7, along with summaries of their habitat requirements and potential for occurrence within the project area. No potential habitat for any sensitive plant species is present within or adjacent to the project area.

Table 7. 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- Atwell Gulch Member; 5,100 to 6,400 feet	Pinyon-juniper woodlands and desert shrub.	No	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	No	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; 5,800-9,000 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale	No	No

Table 7. 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>
		endemic species		
Harrington's beardtongue (<i>Penstemon harringtonii</i>)	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200-9,200 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; 6,300-8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

Environmental Consequences

Proposed Action

Because no occurrences and no potential habitat for any sensitive plant species or known or believed to occur within or adjacent to the project area, the project would have no impact on any sensitive plant species.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. Therefore, the project would have no impact on any sensitive plant species.

WILDLIFE

Affected Environment

Table 7 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 7. Potential for Occurrence of BLM Sensitive Wildlife and Project Impacts		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Fringed myotis (<i>Myotis thysanodes</i>) and Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	Breed and roost in caves, trees, mines, and buildings; hunt over pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
Northern goshawk (<i>Accipiter gentilis</i>)	Predominantly uses spruce/fir forests but also uses Douglas-fir, various pines, and aspens.	Possible (winter)

Table 7. Potential for Occurrence of BLM Sensitive Wildlife and Project Impacts		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Nests and roosts in mature cottonwood forests along rivers, large streams, and lakes.	Possible ; nests and roosts along Colorado River
Peregrine falcon (<i>Falcon peregrinus</i>)	Nests on cliffs, usually near a river, large lake, or ocean. Hunts for waterfowl on water or upland fowl across grasslands and steppe.	Possible (foraging)
Brewer's sparrow (<i>Spizella breweri</i>)	Nests in large stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Unlikely; habitat marginal
Midget faded rattlesnake (<i>Crotalus oreganus concolor</i>)	Cold desert dominated by sagebrush and with an abundance of rock outcrops and exposed canyon walls, typically farther west than the project area.	Unlikely; habitat marginal
Northern leopard frog (<i>Lithobates pipiens</i>)	Wet meadows and the shallows of marshes, ponds, lakes, streams, and irrigation ditches.	No suitable habitat
Great Basin spadefoot (<i>Spea intermontana</i>)	Habitat includes pinyon-juniper woodlands and semi-desert shrublands, typically farther west than the project area.	No suitable habitat
Flannelmouth sucker (<i>Catostomus latipinnis</i>) and roundtail chub (<i>Gila robusta</i>)	Restricted to rivers and major tributaries.	Present in Colorado River
Bluehead sucker (<i>Catostomus discobolus</i>)	Found in smaller streams with a rock substrate and mid to fast flowing waters.	No suitable habitat
Colorado River cutthroat trout (<i>Oncorhynchus clarki pleuriticus</i>)	Headwaters streams and ponds with cool, clear waters and no non-native cutthroat subspecies	No suitable habitat

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. This large accipiter ("bird-hawk") nests primarily in upper montane and subalpine coniferous and mixed aspen-conifer forests throughout the Colorado mountains, where it hunts by flying rapidly through the forest in search of small birds, squirrels and chipmunks, and rabbits. In winter, vagrant goshawks may move to lower elevation pinyon-juniper habitats in search of prey and milder conditions.

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 and for upland fowl and other birds across open terrain such as grasslands and sagebrush steppe. Use of the wooded project area is unlikely except for infrequent overflights while traveling between the Colorado River and cliff bands south and north of the river.

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 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.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. Therefore, the project would have no impact on any sensitive animal species.

Analysis on Public Land Health Standard 4 for Special Status Species

According to a recent LHA, habitat conditions within this area appear suitable for special status animal species known or likely to occur (BLM 2000). 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 would continue to reduce habitat patch size and affect both habitat quality and quantity. The potential to impact some species would increase as development continues.

Based on the protective stipulations listed in Appendix A, the Proposed Action would not jeopardize the viability of any population of special status plant or animal species due to habitat loss, modification, fragmentation, or indirect effects. The project would have no significant consequence on habitat condition, utility, or function or any discernible effect on species abundance or distribution at a landscape scale. Public Land Health Standard 4 would continue to be met.

Vegetation

Affected Environment

Most of the project area proposed for pad expansion is located within the 2.6 acre area disturbed during the initial construction of the PA-29 well pad, and then seeded with native plant species for temporary reclamation in 2007. The vegetation here is dominated by these seeded grass species, including western wheatgrass (*Pascopyrum smithii*), thickspike wheatgrass (*Elymus lanceolatus* ssp. *lanceolatus*), bluebunch wheatgrass (*Pseudoroegneria spicata*), squirreltail grass (*Elymus elymoides*), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Achnatherum hymenoides*). Other native species present include rubber rabbitbrush (*Ericameria nauseosa*), broom snakeweed (*Gutierrezia sarothrae*), orange globemallow (*Sphaeralcea coccinea*), and curlycup gumweed (*Grindelia squarrosa*). Non-native species are also widespread and include intermediate wheatgrass (*Thinopyrum intermedium*), crested wheatgrass (*Agropyron cristatum*), orchardgrass (*Dactylis glomerata*), yellow sweetclover (*Melilotus officinalis*),

salsify (*Tragopogon dubius*), prickly lettuce (*Lactuca serriola*), Russian-thistle (*Salsola tragus*), and kochia (*Bassia scoparia*). Three noxious weed species are also present: cheatgrass (*Bromus tectorum*), field bindweed (*Convolvulus arvensis*), and musk thistle (*Carduus nutans*). Vegetation cover is patchy, with areas of good cover and areas of bare ground.

The area of new disturbance, 0.9 acre in size, is located within pinyon-juniper (*Pinus edulis-Juniperus osteosperma*) habitat and vegetated with native species. The tree canopy cover is relatively dense in most of this area, and the understory includes a mix of shrubs, forbs, and grasses. Common species include roundleaf snowberry (*Symphoricarpos rotundifolius*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), mountain-mahogany (*Cercocarpus montanus*), rock goldenrod (*Petradoria pumila*), spiny phlox (*Phlox hoodii*), and brittle pricklypear cactus (*Opuntia fragilis*). Biological soil crusts of mosses and lichens occur on the ground surface. This area occurs in a strip to the south of and uphill from the existing pad disturbance area.

Environmental Consequences

Proposed Action

Under the Proposed Action, approximately 2.6 acres of previously disturbed and temporarily reclaimed vegetation would be removed. An additional 0.9 acre of native pinyon-juniper vegetation would be lost. Of this total disturbance area, all but 1.6 acres would be reseeded for temporary reclamation following completion of drilling. The proposed disturbance would increase the site's vulnerability to invasion and establishment of noxious weeds and other Non-native invasive plant species. Implementation of the COAs for revegetation would result in seeding with native grass species, which would assist in the reestablishment of a native grass plant community similar to that of the previously reclaimed area. The 0.9 acre of pinyon-juniper and associated shrub and forb vegetation would be replaced by this reclamation vegetation dominated by seeded native grasses. Implementation of the weed management COAs would greatly reduce the risk of weed establishment within and adjacent to the disturbed area.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. Therefore, the vegetation would remain unaltered, and the previously disturbed area would continue along its current temporary reclamation trajectory.

Visual Resources

Affected Environment

The Proposed Action is located on public lands administered by the BLM approximately 2.6 air miles southeast of Parachute, Colorado. These lands are classified as Visual Resource Management (VRM) Class III and Class IV as identified by the 1984 Glenwood Springs Resource Management Plan (Figure 7). The objectives for VRM Classes III and IV, as defined in the BLM's Manual H-8410-1 – Visual Resource Inventory (BLM 1986), are described below.

- The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- The objective of VRM Class IV is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of the viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

The proposed PA-29 pad expansion would occur entirely on VRM Class III land. The two proposed 8-inch surface waterlines and 5.5-inch steel frac line would traverse both VRM Class III and Class IV land.

The project area consists of finger-like mesas gently sloping upward towards the south/southeast from the Colorado River valley floor. The mesa slopes are dissected by drainages and terminate at the toe of Battlement Mesa ridgeline slopes. The area is characteristic of rural ranching land, scattered rural residences, the residential community of Battlement Mesa, and oil and gas development. The Proposed Action would occur at the northern toe of the ridgeline that descends from Battlement Mesa and at the southern end of the finger-like mesas described previously. Vegetation consists of a partially burned pinyon juniper woodland and sagebrush flats that are now dominated by grasses.

The visual impact analysis is based on views from two Key Observation Points (KOPs) representing two linear viewing locations, viewing angles, and viewing directions with the highest frequency of viewers: the intersection of County Road 300 (Stone Quarry Road) and Dry Creek Road and the corner of County Road 303 (Gardner Lane) and County Road 308 (4 Corners Road). The two KOPs represent typical views that a viewer would see from the Battlement Mesa community and adjacent rural residences. These KOPs are shown in Figures 8 and 9 respectively.

Environmental Consequences

Proposed Action

Visual impacts of constructing and occupying the PA-29 pad for accessing and producing Federal oil and gas resources were analyzed previously in the SPGAP (BLM 2007). However, with the pad currently in an interim-reclaimed condition, the Proposed Action would repeat those impacts. Short-term visual impacts due to pipeline installation and pad construction, drilling and completion activities would occur within the project area. The construction of the proposed project would create contrast within the landscape by removing the existing vegetation, exposing bare ground, and creating distinct lines and forms within the landscape. The pad, surface facilities and surface pipelines would increase 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. All project components would be constructed on public land and would be subject to the BLM VRM Class designations.

8-inch Temporary Surface Poly Water Lines and 5.5-inch Steel Temporary Surface Frac Line

The two temporary surface water lines (VRM Class III and IV) and frac line (VRM Class III and IV) would be laid parallel to existing roads and pipeline right-of-ways (see Figure 5 and 6). Minimal surface disturbance and visual impacts would be associated with the two proposed temporary surface water lines and frac line. The surface lines would be removed within 2 months following well completions.

PA-29 Pad Expansion

The PA-29 pad is located within VRM Class III. The well pad, located on a gently sloping sagebrush bench, would not be obvious to the casual observer, except during the drilling and completion phase of

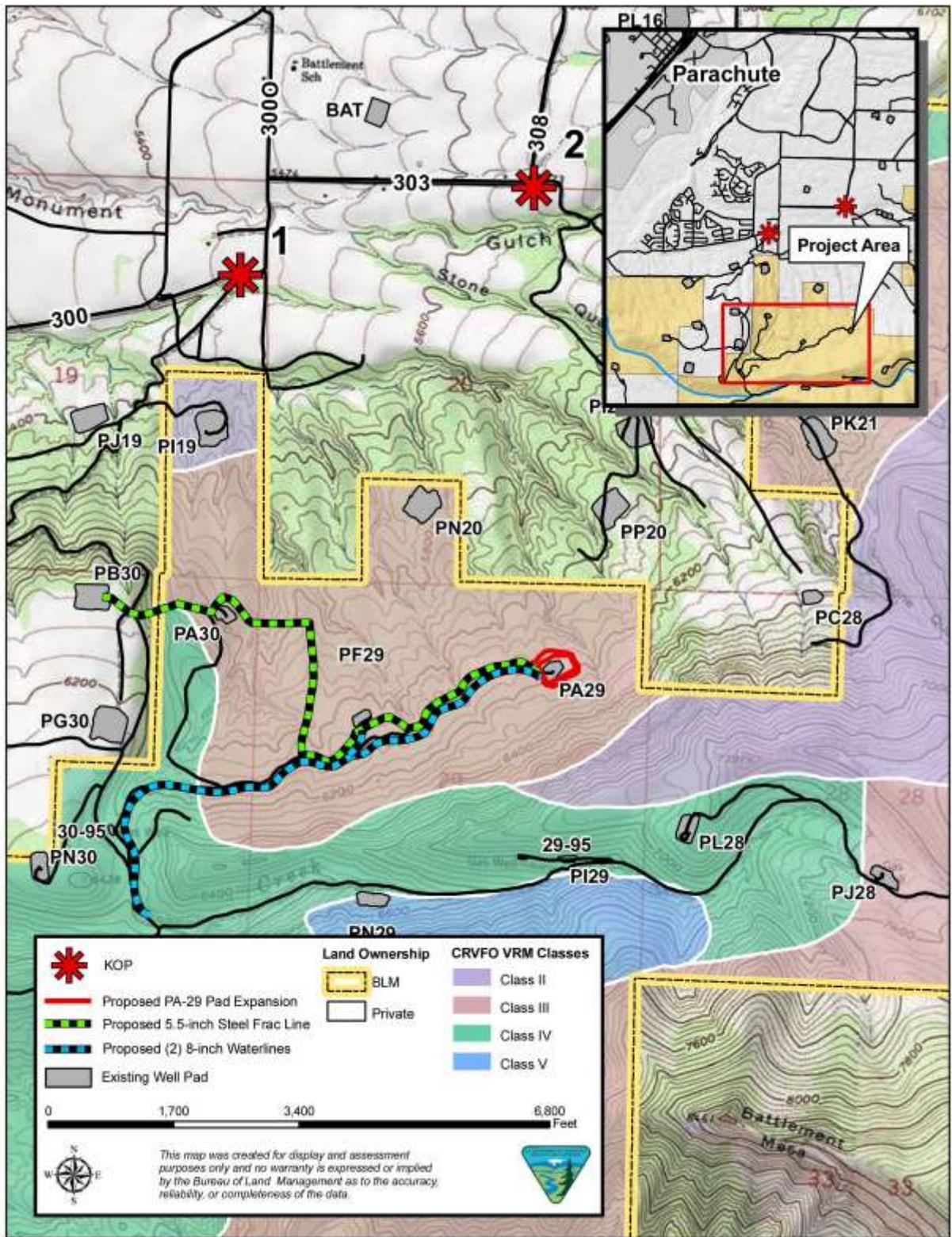


Figure 7. Proposed Action Relationship to CRVFO Visual Resource Management (VRM) Class Designations.



Figure 8. KOP 1 is located at the intersection of County Road 300 (Stone Quarry Road) and Dry Creek Road. This KOP is typical of the view from the community of Battlement Mesa.

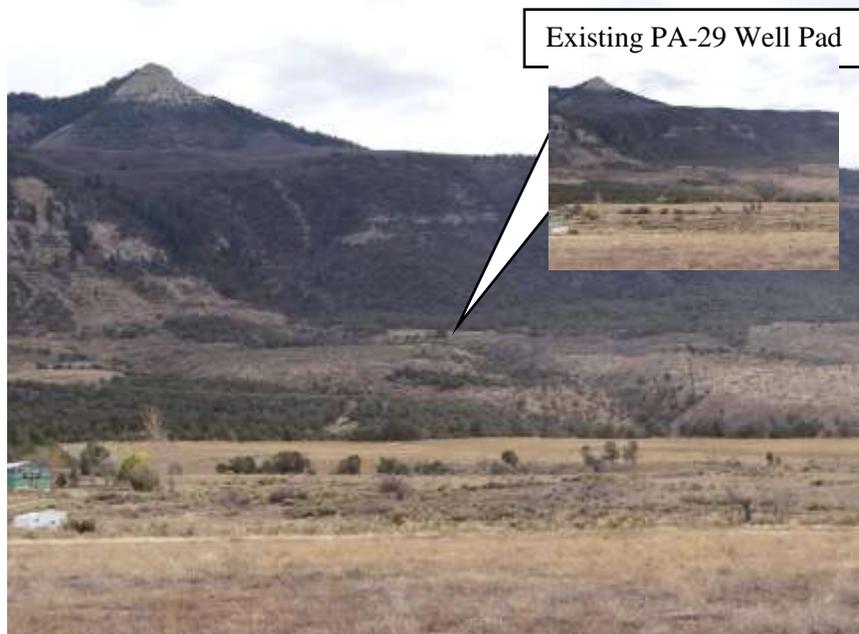


Figure 9. KOP 2 is located at the corner of County Road 303 (Gardner Lane) and County Road 308 (Four Corners Road). This KOP is typical of the view from rural residences immediately outside the community of Battlement Mesa.

the project. The 33-foot cut slope in the south east corner and the 25-foot cut slope in the southwest corner would be the most visible immediately after construction because of minimal vegetation in the immediate vicinity to screen it. The scale of the fill slopes would be screened because the adjacent topography, vegetation, and the angle of view the casual observer would be viewing the pad location. To meet VRM Class III objectives, mitigation requirements are applied as COAs (See Appendix A).

The proposed pad expansion would amount to 0.9 acres of new surface disturbance and 3.5 acres of disturbance within an area currently in a reclaimed condition. Following drilling and completion operations, the total disturbed area would be reduced to a long-term production working surface area of 1.6 acres after interim reclamation.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. This would eliminate new impacts to the visual environment and impacts to VRM Class III and IV lands.

Wastes, Hazardous or Solid

Proposed Action

Hazardous materials used during the construction phase of oil and gas projects 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. These would be kept onsite in limited quantities and trucked to and from the site as required. No hazardous substance as defined in 40 CFR 355, and no acutely hazardous substance as defined in 40 CFR 355, would be used, produced, stored, transported, or disposed in amounts above threshold quantities during pad expansion or drilling, completion, and production operations in conjunction with the seven new Federal wells. Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a limited extent, during project operations. These would be removed to a landfill or water treatment facility as needed, and all would be removed prior to interim reclamation.

Surface water or groundwater could be affected under the Proposed Action due to accidental spills or releases of pollutants associated with vehicles, heavy equipment, or completion and production activities. These could potentially include condensate, produced water, and ethylene glycol or methanol (both used as antifreeze compounds) in addition to fuels and lubricants. In the event of a release, the responsible party would be liable for cleanup and remedial measures. At a minimum, the BLM Grand Junction Field Office contingency plan would apply in addition to operator-specific Spill Prevention, Containment, and Countermeasure (SPCC) plan.

Applicable laws, regulations, standard lease stipulations, and contingency plans and emergency response resources are expected to minimize or avoid impacts related to the use of use hazardous chemicals or the generation of solid or hazardous wastes associated with the Proposed Action.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled, resulting in no additional risk of impacts related to hazardous or solid wastes.

Water Quality, Surface and Ground

SURFACE WATER

Affected Environment

The proposed activities for the PA-29 pad expansion would occur within Colorado River below Rifle Creek 6th code watershed unit which empties directly into the Colorado River approximately 2 miles northwest of the project. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007), unnamed ephemeral drainages that drain most of the project vicinity are within segment 4a, which includes tributaries to the Colorado River from its confluence with the Roaring Fork River to a point immediately below its confluence with Parachute Creek. Following is a brief description of segment 4a.

- Segment 4a – This segment has been classified aquatic life cold 2, recreation N, water supply, 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 N refers to waters that are not suitable or intended to become suitable for primary contact recreation. This segment is suitable or intended to become suitable for potable water supplies and agricultural purposes that include irrigation and livestock use.

All streams within segment 4a are on the State of Colorado’s *303(d) List of Impaired Waters and Monitoring and Evaluation List* (CDPHE, WQCC Regulation No. 93) (CDPHE 2010) for naturally high levels of selenium. *Colorado’s Monitoring and Evaluation List* identifies waterbodies suspected of having water quality problems but for which uncertainty exists regarding one or more factors. The tributaries to the Lower Colorado River which include the project area are on the State of Colorado’s *Monitoring and Evaluation List* for sediment load. The USGS has collected surface water flow and quality data from the Colorado River below the project area near Rulison in 1977 and 1978 (Table 9).

<i>Parameter</i>	<i>Colorado River below Rulison CO, USGS Site #09092570 01/18/1978</i>	<i>Colorado River below Rulison CO, USGS Site #09092570 4/8/1977</i>
Instantaneous discharge (cfs)	1,500	1,560
Temperature, water (°C)	2.5	11
Field pH (standard units)	7.9	8.1
Specific conductance (µS/cm/cm at 25°C)	1,320	1,200
Total Dissolved Solids (mg/L)	756	733
Hardness as CaCO ₃ (mg/L)	280	250
Chloride (mg/L)	230	230
Selenium (µg/L)	2	1
Dissolved oxygen (mg/L)	11.2	10

Source: USGS 2007.

Sediment is a pollutant of concern for the Colorado River Basin (CDPHE, WQCC Regulation No. 93). 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).

Environmental Consequences

Proposed Action

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.

Although surface waters would be most susceptible to sedimentation over the short-term, access roads 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

Refer to Appendix A for COAs applied by the BLM to minimize or avoid 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 are anticipated to be minor.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled. Therefore, no impacts to water quality would occur.

GROUNDWATER

Potential impacts to groundwater resources were adequately addressed in the SPGAP (BLM 2007), and the current Proposed Action would not pose significant additional risk to these resources. This conclusion is based on the vertical separation of several thousand feet between hydrocarbon-producing target formations and shallow fresh-water wells or freshwater aquifers. However, the earlier analysis in the SPGAP did not include an analysis of potential impacts of fresh-water wells or aquifers from hydraulic fracture stimulation to enhance recovery of the hydrocarbon resources. See the section on Geology in the current EA for a discussion of “fracing” and associated potential risks.

Wildlife, Aquatic

Affected Environment

The Proposed Action would occur in an area of highly dissected terrain containing a number of ephemeral drainages. Due to the short stream lengths and small watersheds of ephemeral streams potentially affected by the Proposed Action, fish species do not occur. Aquatic macroinvertebrates most likely to occur include water striders, water boatmen, predaceous diving beetles, and the aquatic larvae of caddisflies and true flies such as biting midges, nonbiting midges, and mosquitoes. Amphibians, if present, would probably be limited to spadefoots and true toads, which are adapted to seasonal flow regimes in arid environments.

Environmental Consequences

Proposed Action

Implementation of the Proposed Action could result in increases in erosion and sedimentation into nearby drainages 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 well pad would not be expanded and no new wells would be drilled, resulting in no additional impacts to aquatic wildlife.

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

The Proposed Action would not jeopardize the viability of any aquatic vertebrate species. The project would have no significant consequences on habitat condition, utility, or function or discernible adverse effects on species abundance or distribution at any landscape scale. Public Land Health Standard 3 would continue to be met (BLM 2000).

Wildlife, Terrestrial

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 American elk (*Cervus canadensis*). 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 falls within CPW-mapped mule deer and elk overall and winter range. It is within a mule deer winter concentration area, and the lower portion immediately north of I-70 is mule deer severe winter range. Severe winter range is the portion of overall winter range used primarily during the most severe winters in terms of temperatures and, especially, snow cover. Consequently, severe winter range is typically at the lower margins of overall winter range and often comprised of plant species that are not necessarily ideal as forage but remain available when higher quality winter range is covered with deep snow.

Large carnivores potentially present in the project vicinity include the mountain lion (*Puma concolor*), which moves seasonally with its preferred prey, the mule deer, and the black bear (*Ursus americanus*). 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. Smaller carnivores in habitats similar to those near the project site include the raccoon (*Procyon lotor*), ringtail (*Bassariscus astutus*), striped skunk (*Mephitis mephitis*), spotted skunk (*Spilogale gracilis*), and long-tailed weasel (*Mustela frenata*).

Small mammals present within the planning area include rodents such as the rock squirrel (*Otospermophilus variegatus*), golden-mantled ground squirrels (*Callospermophilus lateralis*), least chipmunk (*Neotamias minimus*), packrat (bushy-tailed woodrat) (*Neotoma cinerea*), black-tailed and/or white-tailed jackrabbits (*Lepus californica*, *L. townsendii*), and desert and/or mountain cottontails (*Sylvilagus audubonii*, *S. nuttallii*). Rodents and, to a lesser extent rabbits and hares, are the primary prey for a variety of predators.

BIRDS

The wild turkey (*Meleagris gallopavo*) is native to North America and the largest member of the upland fowl. Wild turkeys are omnivorous, foraging on the ground or climbing shrubs and small trees to feed. They prefer hard mast such as acorns and pine nuts but also relish berries, seeds, and large insects. Wild turkeys may move from cover into open areas such as woodland clearings and the margins of grasslands and pastures dusk and dawn. This site is located approximately 1.2 miles west of the area mapped by the CPW as wild turkey overall range. Neither the pad nor the access route goes through the mapped area.

Therefore, the Proposed Action would not impact this species. See the sections on Migratory Birds and Special Status Species for discussions of other birds in the area.

REPTILES AND AMPHIBIANS

The project area is within elevational range of most reptile species known to occur in Garfield County. Two snake species—the gopher snake (bullsnake)(*Pituophis catenifer*) and striped whipsnake (*Coluber taeniatus*)—were observed during project-specific wildlife surveys. Other reptile species most likely to occur include the collared lizard (*Crotaphytus collaris*), short-horned lizard, (*Phrynosoma hernandesi*), plateau spiny lizard (*Sceloporus tristichus*), tree lizard (*Urosaurus ornatus*), and plateau whiptail (*Aspidocelis velox*), all commonly associated with pinyon-juniper woodlands, sagebrush shrublands, and grassy clearings such as occur in the project area. The milk snake (*Lampropeltis triangulum*), western terrestrial garter snake (*Thamnophis elegans*), and smooth green snake (*Opheodrys vernalis*) are potentially present but mostly associated with moister habitats.

Amphibians potentially present in the project vicinity include Woodhouse's toad (*Anaxyrus woodhousii*) and the western chorus frog (*Pseudacris triseriata*). Within the CRVFO area, Woodhouse's toad occurs primarily along ephemeral washes that do not support fish and contain persistent pools for at least a few weeks in 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 3.5 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 pre-disturbance conditions rather quickly when disturbance stops.

No Action Alternative

Under the No Action alternative, the well pad would not be expanded and no new wells would be drilled, resulting in no additional impacts to terrestrial wildlife.

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

The Proposed Action would not jeopardize the viability of any aquatic and terrestrial vertebrate species. The project would have no significant consequences on habitat condition, utility, or function or discernible adverse effects on species abundance or distribution at any landscape scale. Public Land Health Standard 3 would continue to be met areas that include the Battlement Mesa LHA (BLM 2000).

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.

None of the cumulative impacts was described in the 1999 FSEIS (BLM 1999a) or the SPGAP (BLM 2007) to which this EA is tiered, as significant. Although new technologies and regulatory requirements have reduced the impacts of some land uses, nonetheless the past, present, and reasonably foreseeable future actions have had and will continue to have adverse effects on various elements of the human environment. Anticipated impacts for existing and future actions range from negligible to potentially major at a localized level, and primarily negative, for specific resources.

The primary bases for this assessment are twofold: First, the rate of development, particularly oil and gas development has generally been increasing in the area, resulting in an accelerated accumulation of individually nominal effects. Second, all of the residential and commercial expansion and the large majority of oil and gas projects in the CRVFO have occurred on private lands where mitigation measures designed to protect and conserve resources may not be applied to the same extent as on BLM lands. Recent COGCC regulations have closed considerably the gap between the potential environmental impacts associated with development of private versus Federal fluid mineral resources.

The Proposed Action would contribute incrementally to the collective adverse impact for some resources, including air quality, vegetation, migratory birds, and terrestrial wildlife.

PERSONS AND AGENCIES CONSULTED

Encana Oil & Gas (USA) Inc.: Jevin Croteau

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 impacts likely to occur from implementation of the Proposed Action, and identification of appropriate COAs to be attached and enforced by BLM, are listed in Table 10.

Table 10. BLM Interdisciplinary Team Authors and Reviewers

<i>Name</i>	<i>Title</i>	<i>Areas of Participation</i>
D. J. Beaupeurt	Realty Specialist	Lands and Realty
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Peter Cowan	Petroleum Engineer	Downhole COAs
Shauna Kocman, Ph.D., P.E.	Petroleum Engineer, Air Program Lead	Air Quality, Noise, Soils, Surface Water
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, Paleontology

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APPENDIX A

Surface-Use and Downhole Conditions of Approval

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**GENERAL SURFACE-USE CONDITIONS OF APPROVAL
Seven Federal Wells from the PA-29 Well Pad
DOI-BLM-CO-N040-2012-0112-EA**

The following surface-use conditions of approval (COAs) are in addition to stipulations attached to the respective Federal leases and to any site-specific COAs for individual well pads. Wording and numbering of these COAs may differ from those included in the South Parachute GAP (DOI-BLM-CO-N040-2006-050-EA). In cases of discrepancies, the following COAs supersede earlier versions.

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.
2. 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. 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.
4. 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.

5. 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.

6. Wetlands and Riparian Zones. The operator shall restore temporarily disturbed wetlands or riparian areas. The operator shall consult with the BLM Colorado River Valley Field Office to determine appropriate mitigation, including verification of native plant species to be used in restoration.
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 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 number 19) shall be implemented for well pad construction whenever topography allows.

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.

- 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 Attachments 1 and 2 of the letter provided to operators dated October 23, 2012).

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 percent by weight of other weed seeds. Seed may contain up to 2.0 percent 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 measures approved by the BLM. Cut-and-fill slopes along drainages or in areas with high erosion potential shall also be protected from erosion using hydromulch designed specifically for erosion control or biodegradable blankets/matting, bales, or wattles of weed-free straw or weed-free native grass hay. A well-anchored fabric silt fence shall also be placed at the toe of cut-and-fill slopes along drainages or to protect other sensitive areas from deposition of soils eroded off the slopes. Additional BMPs shall be employed as necessary to reduce soil erosion and offsite transport of sediments.
- 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 percent 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 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 shall be submitted to BLM by **December 1**.

9. 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. To protect nesting raptors, a survey shall be conducted prior to construction, drilling, or completion activities that are to begin during the raptor nesting season (February 1 to August 15). The survey shall include all potential nesting habitat within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. Results of the survey shall be submitted to the BLM. If a raptor nest is located within the buffer widths specified above, a 60-day raptor nesting TL for the period **May 1 to July 1** will be applied by the BLM to preclude initiation of construction, drilling, and completion activities during the nesting period of the raptor species present. The operator is responsible for complying with the MBTA, which prohibits the “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. 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 audial 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. 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. Ips Beetle. To avoid mortality of pinyon pines due to infestations of the *Ips* beetle, any pinyon trees damaged during road, pad, or pipeline construction shall be chipped after being severed from the stump or grubbed from the ground, buried in the toe of fill slopes (if feasible), or cut and removed from the site within 24 hours to a location approved by the Colorado State Forest Service.
16. Paleontological 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.

17. 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).

18. 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 to maximize reshaping of cut-and-fill slopes and interim reclamation of the pad.

Above-ground facilities shall be painted with BLM Standard Environmental Color **Shale Green** to minimize contrast with adjacent vegetation or rock outcrops.

All woody vegetation (live and dead) shall remain standing at the toe of the fill slopes and at the top

of the cut slopes of the well pad and access road to provide visual screening. All woody vegetation left standing at the toe and at the top of the cut slopes shall be protected and remain standing and undamaged when fill material is pulled back to recontour the well pad.

19. 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.
20. Reserve Pit. A minimum of 2 feet of freeboard shall be maintained in the reserve pit. Freeboard is measured from the highest level of drilling fluids and cuttings in the reserve pit to the lowest surface elevation of ground at the reserve pit perimeter.
21. Soils. Cuts and fills shall be minimized when working on erosive soils and slopes in excess of 30 percent. Cut-and-fill slopes shall be stabilized through revegetation practices with an approved seed mix shortly following construction activities to minimize the potential for slope failures and excessive erosion. Fill slopes adjacent to drainages shall be protected with well-anchored silt fences, straw wattles, or other acceptable BMPs designed to minimize the potential for sediment transport. On slopes greater than 50 percent, BLM personnel may request a professional geotechnical analysis prior to construction.

SITE-SPECIFIC COAS APPLICABLE TO THE PA-29 WELL PAD

The following site-specific surface use COAs are in addition to the general COAs applicable to all wells within the PA-29 well pad and all stipulations attached to the respective Federal leases.

1. A survey for noxious weeds will be required for the newly disturbed surface areas (in particular the northwest side of the pad where there is currently a small stand of junipers) and all proposed pipelines that have not already been surveyed prior to construction and drilling activities.
2. A survey for the BLM sensitive plant species *Penstemon harringtonii* will be required for all pipeline routes that have not already been surveyed prior to installation of the pipelines.
3. The existing range fence shall be moved back during construction and then re-placed in its original position once construction is completed (particularly where the fence meets the gate on the existing access road)
4. Appropriate measures shall be taken to ensure that the juniper trees on the fill slope will be left in place to the greatest extent possible. The purpose of this COA is to maintain trees in place for visually screening the pad from the I-70 corridor and the community of Battlement Mesa.
5. A minimum 24-inch diameter culvert shall be installed across the existing access road near the entrance to the well pad as shown in the April 23, 2012 well plat revision.

BUREAU OF LAND MANAGEMENT

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

DOWNHOLE CONDITIONS OF APPROVAL Applications for Permit to Drill

Operator: Encana Oil & Gas (USA) Inc.
Lease number: COC01523
Surface Location: Garfield County; Lot 1, Sec. 29 T7S R95W
Pad(s): PA-29
Petroleum Engineer: Peter Cowan

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; and Alex Provstgaard, 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 BLM Petroleum Engineers, 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 **3M** system and recorded in the IADC/Driller's log. A casing head rated to 3,000 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 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/intermediate 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/intermediate 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 (picowan@blm.gov) on the first well drilled on the pad or any 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:

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List of Wells			
<i>Proposed Pad</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
PA 29 Pad (Federal Surface)	28-5BB	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 28 SWNW
	29-1D*	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 Lot 1
	29-2A	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 Lot 2
	29-3A	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 Lot 2
	29-7BB	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 SENE
	29-8	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 SENE
	29-8BB	T7S R95W, Sect. 29 Lot 1	T7S R95W, Sect. 29 SENE

*The 29-1D well is part of a communitization agreement, CA128382.

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FONSI

DOI-BLM-CO-N040-2012-0112-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 environmental elements analyzed in this EA or incorporated by reference from the South Parachute Geographic Area Plan (SPGAP), EA #CO140-2006-050, approved on August 28, 2007. The current EA is tiered to the 2007 Environmental Assessments, pursuant to the National Environmental Policy Act (NEPA). Therefore, an Environmental Impact Statement (EIS) is not necessary to analyze further 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 will 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 seven new Federal oil and gas wells to be added to the existing PA-29 well pad may commence only upon approval by the BLM of an Application for Permit to Drill (APD) submitted by Encana Oil & Gas (USA) Inc.

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 PA-29 well pad.

NAME OF PREPARER: Christine Cimiluca, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:



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

DATE: 11-27-12