

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

ENVIRONMENTAL ASSESSMENT

NUMBER

DOI-BLM-CO-N040-2013-0042-EA

CASEFILE NUMBER

Federal Oil and Gas Lease COC51156.

PROJECT NAME

Proposal to Drill Nine Federal Wells from the Proposed J6SEB Well Pad on BLM Land into the Underlying Federal Lease COC51156 in the Hunter Mesa Unit, Garfield County, Colorado.

PAD LOCATION

Township 8 South (T8S), Range 92 West (R92W), Section 6, NWSE, Sixth Principal Meridian

APPLICANT

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

PROPOSED ACTION

Encana Oil & Gas (USA) Inc. (Encana) proposes to drill and develop nine Federal gas wells from one proposed pad, the J6SEB, located in the Hunter Mesa Unit, Garfield County, Colorado (Figure 1). The J6SEB pad is located on BLM land (BLM surface underlain by Federal minerals). The Federal wells would be directionally drilled into Federal lease COC51156. Encana plans to construct the pad in April 2013 and begin drilling the wells in May 2013. The project would result in approximately 14 acres of initial surface disturbance (construction of the proposed well pad and pipeline) and 6 acres of long-term disturbance through the production phase (Table 1). Figures 2 and show the layout of the pad during construction and during production phase following interim reclamation. Names and locations of the well(s) are presented in Table 2.

Table 1. Initial and Long-term Disturbance of Project Components		
<i>Component</i>	<i>Initial Disturbance</i>	<i>Long-term Disturbance</i>
Well Pad	7.35 acres	2.43 acres
Access Road (Existing)	0 acres	0 acres
Pipeline	6.60 acre	3.60 acres
Total (rounded to 0.1)	14.0 acres	6.0 acres

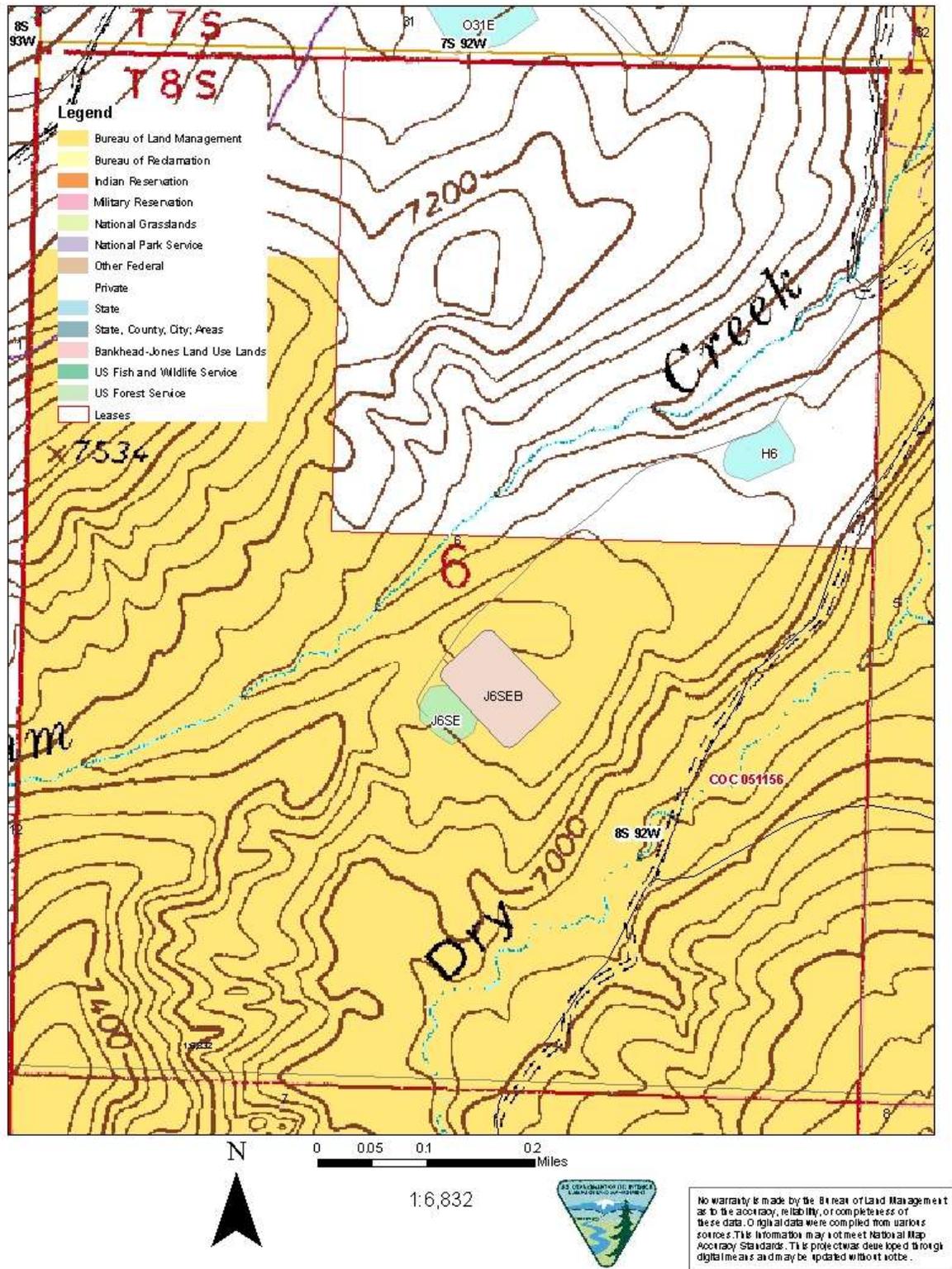


Figure 1. Location Map showing Existing Pad Access Road and Surface and Mineral Ownership.

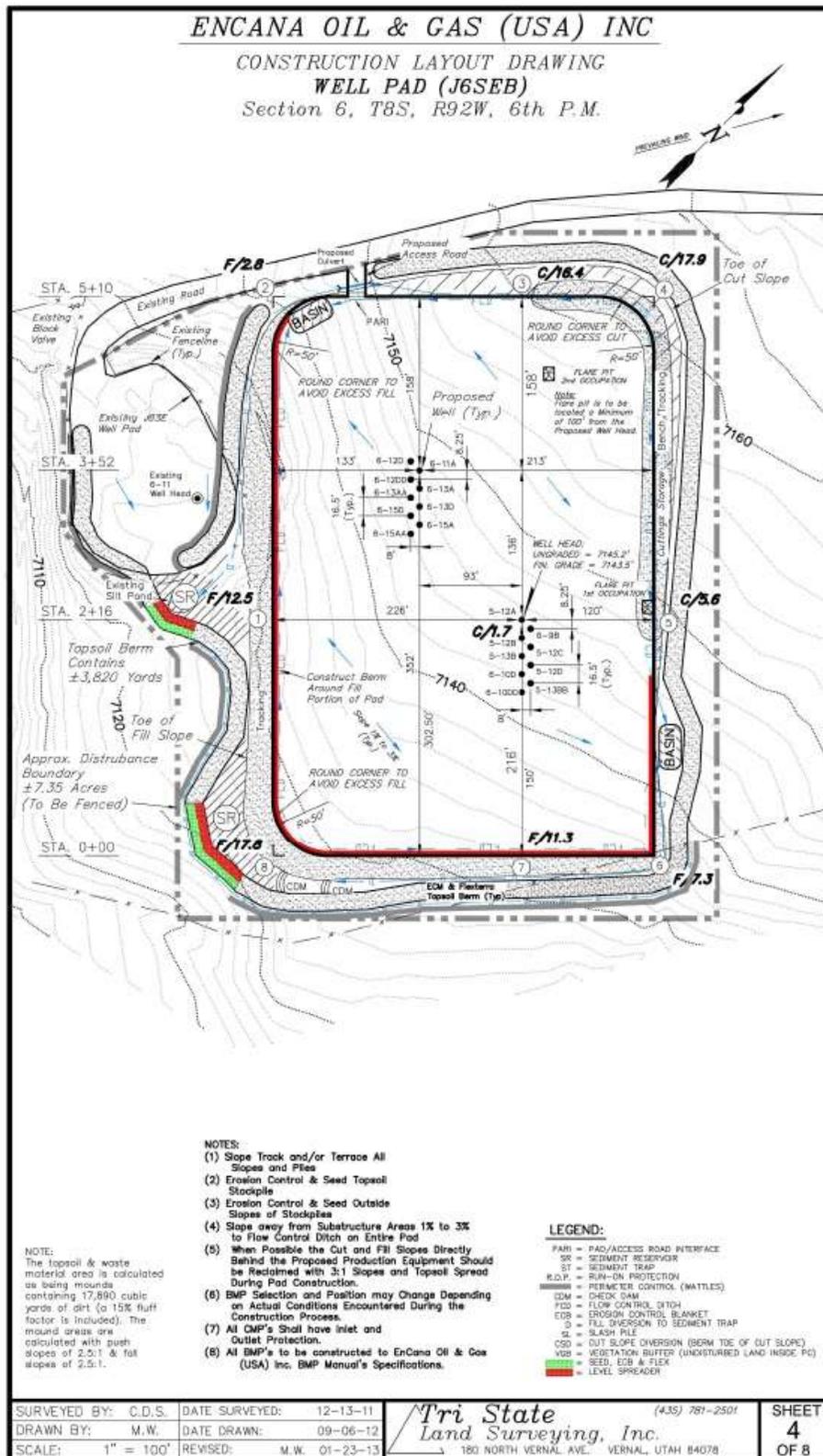


Figure 2. J6SEB Pad Construction Layout

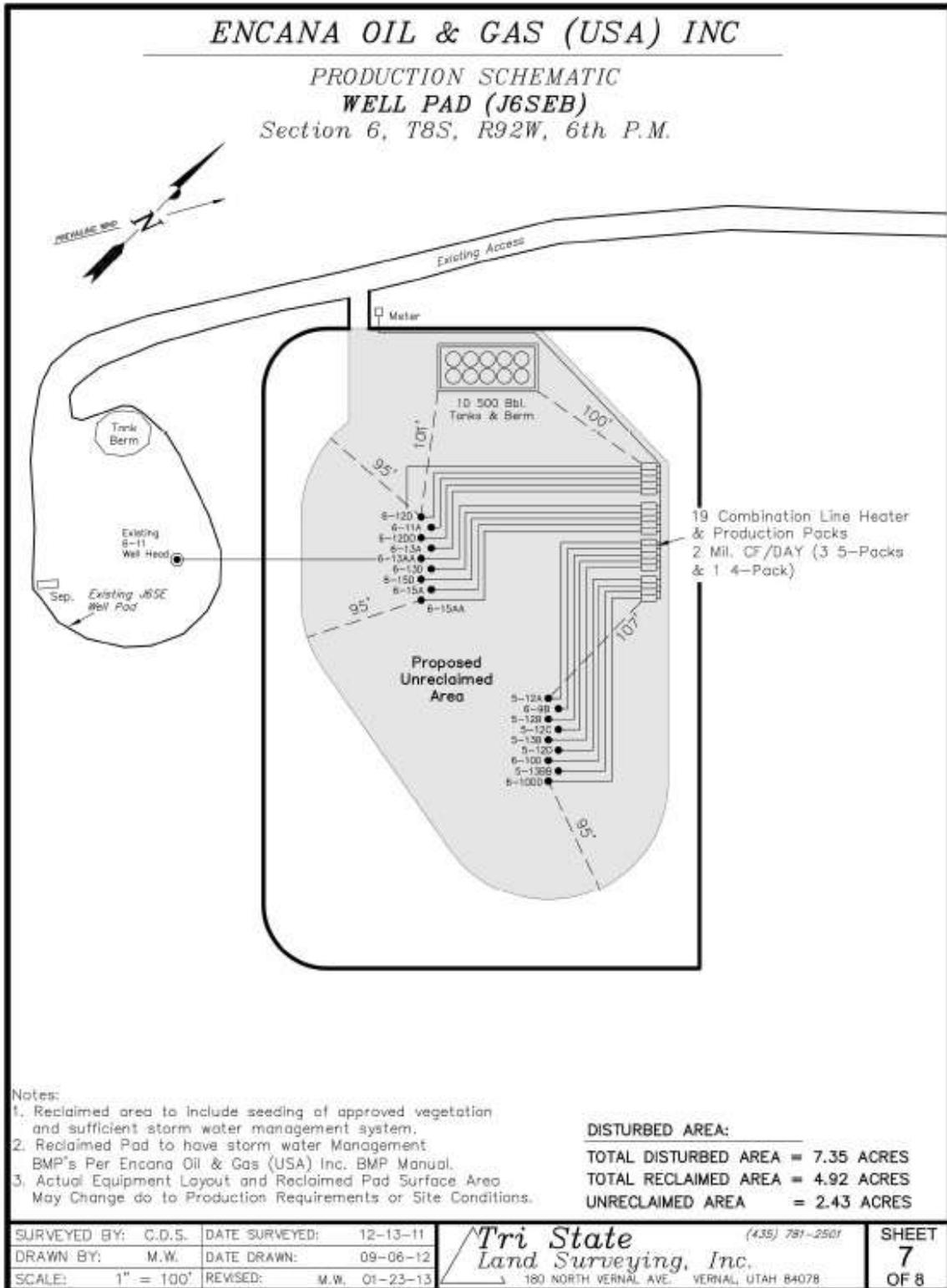


Figure 3. J6SEB Interim Reclamation Plat.

The original J6SE well pad was included by Encana as a proposed well pad in the *Gant Gulch Geographic Area Plan (GGGAP)*, approved on October 17, 2005 (CO140-2005-134-EA). The J6SEB pad would be located adjacent to the J6SE pad, and all existing facilities on the J6SE pad would be moved to the J6SEB pad after it is constructed.

Table 2. Surface and Bottomhole Locations of Proposed Federal Wells			
<i>Proposed Pad</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
J6SEB	HMU 6-11A	T8S R92W, Section 6 NWSE, 1957 feet FSL 1920 feet FEL	T8S R92W, Section 6 NWSE, 2358 feet FSL 1352 feet FEL
J6SEB	HMU 6-12D	T8S R92W, Section 6 NWSE, 1957 feet FSL 1931 feet FEL	T8S R92W, Section 6 NWSE, 1795 feet FSL 751 feet FEL
J6SEB	HMU 6-12DD	T8S R92W, Section 6 NWSE, 1945 feet FSL 1919 feet FEL	T8S R92W, Section 6 NWSE, 14.068 feet FSL 756 feet FWL
J6SEB	HMU 6-13A	T8S R92W, Section 6 NWSE, 1945 feet FSL 1908 feet FEL	T8S R92W, Section 6 NWSE, 1198 feet FSL 745 feet FWL
J6SEB	HMU 6-13AA	T8S R92W, Section 6 NWSE, 1945 feet FSL 1908 feet FEL	T8S R92W, Section 6 NWSE, 814.0 feet FSL 818 feet FWL
J6SEB	HMU 6-13D	T8S R92W, Section 6 NWSE, 1933 feet FSL 1896 feet FEL	T8S R92W, Section 6 NWSE, 472 feet FSL 818 feet FWL
J6SEB	HMU 6-15A	T8S R92W, Section 6 NWSE, 1921 feet FSL 1885 feet FEL	T8S R92W, Section 6 NWSE, 988 feet FSL 1402 feet FEL
J6SEB	HMU 6-15AA	T8S R92W, Section 6 NWSE, 1910 feet FSL 1885 feet FEL	T8S R92W, Section 6 NWSE, 655 feet FSL 1410 feet FEL
J6SEB	HMU 6-15D	T8S R92W, Section 6 NWSE, 1922 feet FSL 1896 feet FEL	T8S R92W, Section 6 NWSE, 297 feet FSL 1363 feet FEL

A closed-loop drill system would be used, and no reserve pit would be required. The recovered drilling fluid would be stored on location in steel tanks to allow reuse for drilling operations. Cuttings generated during drilling would be deposited in a steel cuttings bin (approximately 45 feet by 10 feet by 12 feet) and a cuttings pile. Cuttings deposited in the cuttings bin would be solidified with sawdust and then moved to the cuttings pile. After drilling is complete, cuttings would be buried on the location and reclaimed.

Existing access roads would serve the proposed wells. No new access roads are proposed. Grand River Gathering LLC would construct, operate, and maintain one 8-inch-diameter steel, welded, buried natural gas pipeline which would serve the proposed J6SEB pad. The proposed pipeline action would be implemented with the issuance of a BLM right-of-way grant for an 8-inch diameter natural gas pipeline, approximately 689.5 feet long, with a permanent width of approximately 30 feet and an additional temporary construction width of 25 feet. The entire length of the project would be approximately 5,230 feet. The right-of-way width would be 55 feet during construction, reduced to a permanent width of 30 feet by reclamation of temporarily disturbed areas (Figure 4).

The right-of-way grant would be issued under the Mineral Leasing Act of 1920 (MLA), as amended. The MLA (Sec. 28 (a)) authorizes Federal agencies to grant ROWs for pipeline purposes for the transportation of oil, natural gas, synthetic liquid or gaseous fuels, or any refined product. The MLA at Sec. 28 (e) further gives Federal agencies authority to allow temporary uses of Federal lands for construction, operation, and maintenance of pipelines. The 6-inch buried water line would be authorized with the BLM ROW grant pursuant to Title V of the Federal Land Policy and Management Act (FLPMA).

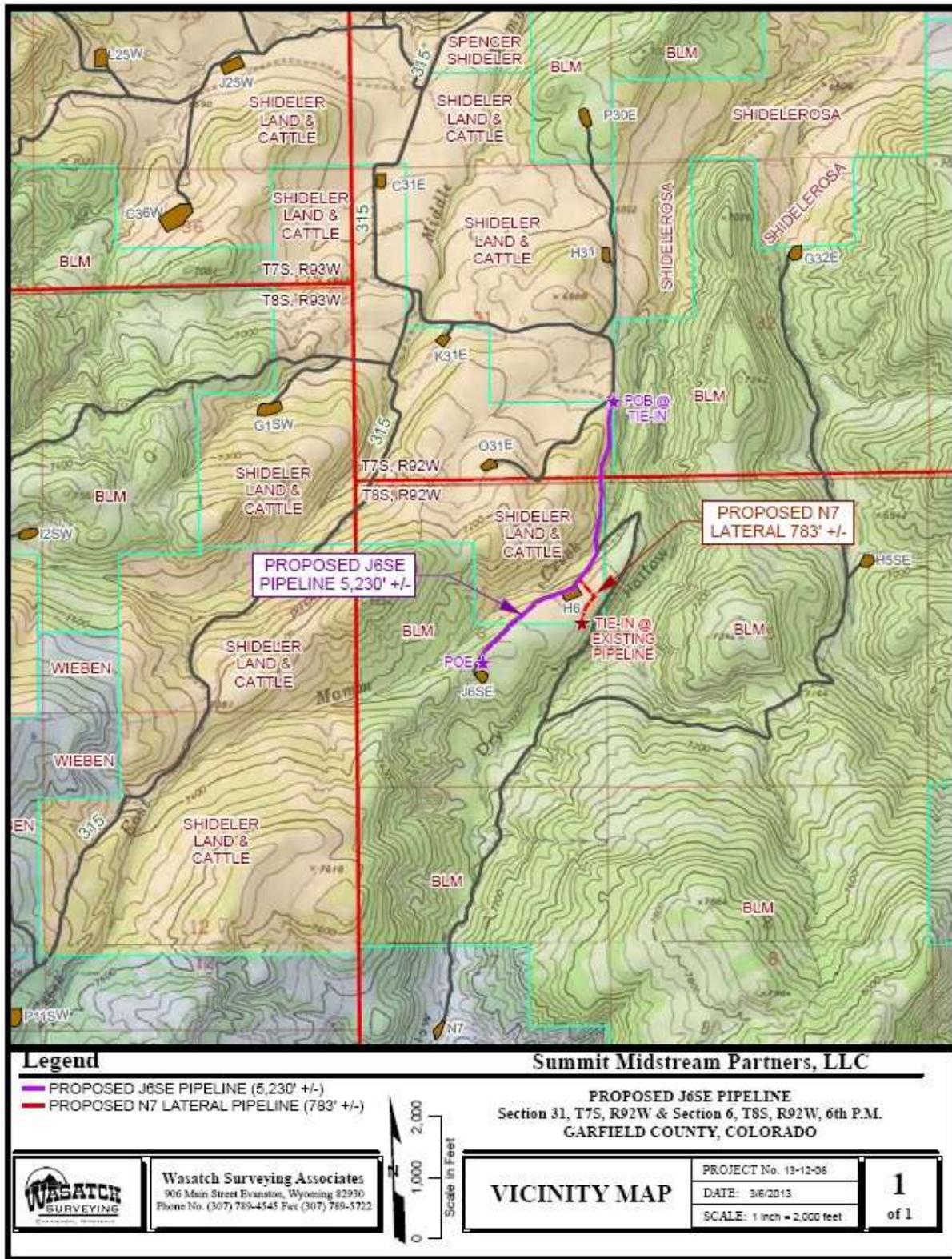


Figure 4. Proposed Grand River Gathering Natural Gas Pipeline to Serve the J6SEB pad.

The source of water for drilling and completion would be Encana's available water rights from the river. Water would be transported to the pad by water haulers. For completion operations, Encana would install a temporary 8-inch waterline 30 days before operations are planned and would remove the waterline 60 days after completions are finished. The temporary surface waterline would cross BLM and Fee lands, and would be approximately 8,822 feet in length. The temporary water line would run from the J6SEB pad to an existing surface pipeline at the existing O31E pad, located in SW/SE Section 31, Township 7 South, Range 92 West.

Pad construction work would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). A road maintenance program would be required during the production phase of the wells which includes, but is not limited to, blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. Roads would be maintained in a safe and usable condition.

The Proposed Action would include drilling and completion, production of natural gas and associated liquid condensate, proper handling and disposal of produced water, and interim and final reclamation. The Proposed Action would be implemented consistent with Federal oil and gas lease, Federal regulations (43 CFR 3100), and the operational measures included in the Applications for Permit to Drill (APDs). Appendix A lists the specific Surface Use Conditions of Approval (COAs) that would be implemented as mitigation measures for this project. The operator would be responsible for continuous inspection and maintenance of the access roads, pads and pipelines.

NO ACTION ALTERNATIVE

The Proposed Action involves the drilling of up to nine Federal wells from BLM surface into the subsurface minerals encumbered with Federal oil and gas lease COC51156. Although the Bureau of Land Management (BLM) cannot deny the right to drill and develop the leasehold, 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. In so doing, the proposed Federal wells would not be approved, and associated impacts would not occur.

PURPOSE AND NEED FOR THE ACTION

The purpose of the Proposed Action is to develop oil and gas resources on Federal lease COC51156 consistent with existing Federal lease rights. The Proposed Action is needed to increase the development of oil and gas resources for commercial marketing to the public.

SUMMARY OF LEASE STIPULATIONS

A big game winter range Timing Limitation (TL) attached as a stipulation to Federal lease COC51156, including the project area, prohibits construction, drilling, and completion activities from January 16 through April 19 of each year. Site-specific COAs developed as a result of project-specific surveys associated with this Environmental Assessment (EA) and review of Applications for Permit to Drill (APDs) for the nine new Federal oil and gas well would apply to the J6SEB pad and portions of the access road specific to the pad. These COAs are listed in Appendix A.

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 Record of Decision 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 was designated as open to oil and gas leasing and development, and Federal lease COC51156 was duly leased pursuant to the 1999 RMP amendment. Furthermore, the Proposed Action is associated with and would occur within the boundaries of the *Gant Gulch GAP* (CO140-2005-134-EA). The Proposed Action is therefore in conformance with the current land use plan, as amended.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

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

Access and Transportation

Affected Environment

The project area would be located approximately 16.4 miles southeast of Rifle, Garfield County, Colorado. The primary vehicle access is as follows: From highway I-70 at Exit 94, proceed south approximately 3.6 miles to the junction with Mamm Creek Road. Turn right on Mamm Creek road and travel in a southwesterly direction approximately 10.4 miles to the intersection of Mamm Creek road and an existing road to the east. Turn left and proceed easterly and then southerly approximately 1.4 miles to the intersection with an existing road to the southwest. Turn right and proceed southwesterly approximately 0.5 miles. The access to the proposed J6SEB pad is on the left.

The existing access road to the J6SE pad would be utilized in the construction of the J6SEB pad and the drilling and completion of the new Federal wells. No new access road is required, and no improvements or modifications are proposed for the existing access road.

Maintenance and reclamation would conform to guidelines established in the BLM Gold Book (USDI and USDA 2007). A road maintenance program would be required during the drilling, completion, and production phases which includes, but is not limited to blading, ditching, culvert installation and cleanout, weed control, and gravel surfacing where excessive rutting or erosion may occur. The access road would be maintained in a safe and usable condition. Surface and subsoil materials within the proposed construction areas would be used. Gravel would be obtained from Federal or Fee lands in conformance with applicable regulations.

Environmental Consequences

Proposed Action

The Proposed Action would result in a substantial increase in truck traffic related to the eventual development of the Federal well. The largest increase in truck use would be during rig-up, drilling, and completion activities. Data indicate that approximately 1,160 truck trips over a 30-day period would be required to support the drilling and completion of each well (Table 3). Once the wells are producing, traffic would decrease to occasional visits for monitoring or maintenance activities. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days.

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

Table 3. Traffic Associated with Drilling and Completion Activities		
<i>Vehicle Class</i>	<i>Trips per Well</i>	<i>Percent of Total</i>
16-wheel tractor trailers	88	7.6%
10-wheel trucks	216	18.6%
6-wheel trucks	452	39.0%
Pickup trucks	404	34.8%
Total	1,160	100.0%

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on access and transportation would be less than under the Proposed Action but not eliminated.

Air Quality

Affected Environment

Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area,

regional air quality monitoring has been conducted in Rifle and elsewhere in Garfield County. Air pollutants measured in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), particulate matter less than 10 microns (μ) in diameter (PM₁₀), and particulate matter less than 2.5 μ in diameter (PM_{2.5}).

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

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

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

Proposed Action

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

The Proposed Action includes building the J6SEB pad and constructing, drilling, completing, and operating 9 new Federal wells. In addition, the pad would total disturbance from construction of a new pad would be 14 acres which would be reduced to 6 acres upon interim reclamation (Table 1). The well would require approximately 7 to 10 days to drill and 5 to 15 days to complete. Air quality in the project area would decrease during construction of the well pad 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. Once construction activities are complete, air quality impacts associated with construction would cease and impacts would transition to emissions associated with transportation of drilling and completion equipment. Fugitive dust and vehicle emissions from mobilization of equipment necessary for the drilling and completions phase and rigging up the drill rig would occur during the transitions between construction, drilling and completions phases. During drilling and completions work air quality impacts would be caused by emissions from generators

and engines to run equipment, onsite and offsite vehicle traffic, and escaped and flared gasses during drilling and flowback phases. Following the completion of these phases, emissions would be greatly reduced to emissions associated with long-term natural gas and condensate production.

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

The modeling also estimated cumulative impacts from future Federal plus private wells in the CRVFO, ranging from a total of 12,072 wells in the “no action” scenario to 15,664 wells in the “maximum development” scenario. During the modeling, estimated future emissions from wells in the CRVFO were added to background air quality levels, major stationary sources, and an additional 28,843 future Federal plus private wells outside the CRVFO but within the modeling domain. These additional wells were based on estimated numbers for three other BLM field offices in the modeling domain—White River Field Office (Meeker, Colorado), Little Snake Field Office (Craig, Colorado), and Vernal Field Office (Vernal, Utah). Methods and results of the modeling are presented in an Air Resources Technical Support Document (ARTSD) (BLM 2011), available for viewing at the CRVFO in Silt, Colorado, and on its website.

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 1deciview 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 either integrated into Encana’s project design or to be applied 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 also be 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). In addition, construction activities for the well pad, access road, and pipelines would occur between the hours of 7:00 a.m. and 6:00 p.m. each day, a generally more favorable period for atmospheric dispersion due to warmer temperatures and less stable air. Fugitive dust emissions from vehicular traffic during drilling and completion would be further reduced if, as planned under the Proposed Action, these activities are allowed to occur during the winter season, when roads are frozen, snow-covered, or wet.

Emissions of volatile organic compounds (VOCs) such as the BTEX constituents of condensate vary depending on the characteristics of the condensate, the volume produced, and tank operations. Operators are required to control emissions of VOCs from condensate tanks under CDPHE Regulation 7. If deemed necessary by the State, the operator may be required to install a vapor recovery or thermal destruction system to further reduce VOC concentrations.

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

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

An inventory and assessment of GHG emissions from oil and gas projects in the CRVFO was included in the air quality modeling completed in October 2011. In all of the modeled development scenarios, annual GHG emissions from Federal wells in the CRVFO would no more than 0.5% of Colorado emissions from natural gas projects in 2008 and 0.0009% of U.S. emissions from natural gas projects in 2005 (EPA 2010).

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on air quality would be less than under the Proposed Action but not eliminated.

Cultural Resources

Affected Environment

Section 106 of the National Historic Preservation Act (NHPA) requires Federal agencies to take into account the effects their actions will have on cultural resources. As a general policy, an agency must

consider effects to cultural resources for any undertaking that involves Federal monies, Federal permitting/authorization, or Federal lands.

Three Class III cultural resource inventories (CRVFO# 54-13-3, 5405-19 and 5406-3) have been conducted either specifically for this proposed pad and pipeline, or for a previously proposed pad and access in the immediate vicinity. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records identified four cultural resources in the project vicinity. All four of the cultural resources are either prehistoric or historic isolated finds and by definition not eligible to the National Register of Historic Places (NRHP). Eligible or potentially eligible cultural sites are referred to in Section 106 of the National Historic Preservation Act as “historic properties.”

Environmental Consequences

Proposed Action

As the only cultural resources identified by the three inventories in the Areas of Potential Effect (APE) or immediate project vicinity are isolated finds, no historic properties are anticipated to be affected by the construction of the proposed natural gas pad. Therefore, the BLM made a determination of “**No Historic Properties Affected.**” This determination was made in accordance with the 2001 revised regulations [36CFR 800.4(d)(1)] for Section 106 of the National Historic Preservation Act (16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement and Colorado Protocol]. As the BLM has determined that the Proposed Action would have no direct impacts to known “historic properties,” no formal consultation was initiated with the SHPO.

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

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

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, the No Action Alternative would most likely reduce though not eliminate the potential for accidental damage, vandalism, illegal collection and excavation on the public lands involved.

Fossil Resources

Affected Environment

The predominant bedrock formation present at or near the surface within the project area is the Wasatch Formation. This formation is overlain by areas of Quaternary aged sediment gravels and alluvial sands and muds. Occurring in varying thicknesses, these Quaternary sediments are considered Potential Fossil

Yield Classification Class 2, defined as having a low probability of fossil occurrence. Class 2 geologic units are not likely to contain vertebrate or scientifically significant invertebrate fossils.

The Wasatch Formation is considered a BLM Condition 4 formation, defined as an area that is known to contain vertebrate fossils or noteworthy occurrences of invertebrate fossils. These types of fossils are known to occur or have been documented, but may vary in occurrence and predictability. The Wasatch Formation is divided into the early Eocene Shire, and the Paleocene age Molina and Atwell Gulch members.

All members of the Wasatch Formation contain vertebrate fossils in varying abundances (Murphy and Daitch 2007). Rocks of the Wasatch Formation are lithologically very similar to one another throughout the Piceance Creek Basin as heterogeneous continental fluvial deposits with interfingering channel sandstone beds and overbank deposits consisting of variegated claystone, mudstone, and siltstone beds (Franczyk et al. 1990). Eocene mammals have been found in the lower part of the Shire member.

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

Environmental Consequences

Proposed Action

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

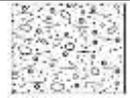
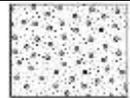
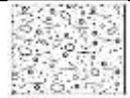
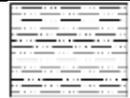
An examination of the BLM paleontology database indicates no fossil localities within a 1-mile radius of the proposed well sites. Areas covered with vegetation and soil cover do not usually yield fossil resources, but inspections would be conducted for proposed facilities that are located on or within 200 feet of Wasatch Formation bedrock surface exposures on Federal lands. Application of the CRVFO's standard COA for the protection of paleontological resources will be attached to the APDs and is detailed in Appendix A.

Geology and Minerals

Affected Environment

The project area is located near the eastern margin of the Colorado Plateau physiographic province (Fenneman 1946), a region characterized by dissected plateaus of strong relief. A broad, asymmetric, southeast-northwest trending structural basin, the Piceance Basin contains stratified sediments ranging in age from Cambrian through middle Tertiary up to 20,000 feet thick. The basin lies between the White

River uplift to the northeast, the Gunnison uplift to the south, and the Uncompahgre swell to the west (George 1927, Weiner and Haun 1960). Table 4 lists the geologic formations within the project area.

Table 4. Geologic Formations within the Study Area					
<i>Map Symbol</i>	<i>Lithologic Pattern</i>	<i>Formation Name</i>	<i>Age</i>	<i>Characteristics</i>	<i>Location</i>
Qsw		Sheetwash Deposits	Holocene	Poorly sorted clay, silt, sand, and gravels.	Slopes and depressions.
Qhm		Gravel of Hunter Mesa	Pleistocene	Poorly sorted sand, gravel, and cobbles.	Underlies terraces.
Qcs		Colluvium and Sheetwash	Pleistocene	Poorly sorted clay, silt, sand, gravel, and cobbles.	Mantels topography.
Tw		Wasatch Formation	Eocene/ Paleocene	Variegated purple, lavender, red-gray, and brown claystone.	Steep slopes and outcrops.
Source: Madole (1999)					

The bedrock exposure within the proposed development project area is the Tertiary Wasatch Formation. The Wasatch Formation consists of variegated siltstone, claystone, and sandstones and ranges from 1,000 to 2,500 feet thick. The Wasatch Formation is underlain unconformably by the Mesaverde Group. The Mesaverde Group is composed of mudstones and sandstones with interlayered coal beds and ranges in thickness from about 3,000 to over 7,000 feet. The Mesaverde Group has also been referred to as the Mesaverde Formation, which includes informal subdivisions based on gas productivity characteristics.

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

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

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

sandstones, varying in thickness from less than 10 feet to more than 50 feet (Spencer and Wilson 1988), creating an interbedded relationship between source and reservoir. The trapping mechanism of the gas is both stratigraphic and diagenetic.

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

Environmental Consequences

Proposed Action

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

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

Invasive Non-Native Plants

Affected Environment

The project area is located in the Mamm Creek drainage within pinyon-juniper and sagebrush habitat types. The J6SE well pad is located at approximately 7,160 feet elevation, and the proposed pipeline ranges in elevation from approximately 6,880 to 7,160 feet elevation. The pad site lies immediately adjacent to a previously disturbed and reclaimed area in sagebrush and grass pasture land, rimmed by pinyon juniper woodland grading into Gambel’s oak and mixed mountain shrub habitats. The adjacent stream drainage southwest of the pad is steeply incised, with areas of barren steep hillsides eroded from the high clay content soils of the upper Wasatch Formation. The pipeline route drops down from the pad through pinyon-juniper, sagebrush, and pastureland.

Vegetation in the area of disturbance associated with the new wells is dominated by native perennial grasses, with a component of non-native perennial pasture grasses and a variety of native shrubs, subshrubs, and perennial forbs.

While the reclaimed habitat consists of good canopy cover with a diversity of native species, non-native species are also abundant. Two State List B noxious weeds are present on the site, houndstongue (*Cynoglossum officinale*) and musk thistle (*Carduus nutans*). In addition are numerous invasive non-native species not state-listed as noxious but posing a risk to successful reclamation and restoration efforts unless effectively prevented or controlled. Among these currently present onsite are the annual grass field brome (*Bromus arvensis*), the perennial forbs common dandelion (*Taraxacum officinale*) and yellow sweetclover (*Melilotus officinale*), and the annual forbs flixweed (*Descurainia sophia*), kochia (*Bassia*

scoparia), lamb's quarters (*Chenopodium album*), prickly lettuce (*Lactuca serriola*), prostrate knotweed (*Polygonum aviculare*), Russian-thistle (*Salsola tragus*), salsify (*Tragopogon dubius*), and tall tumble-mustard (*Sisymbrium altissimum*). Invasive species are more common and dominant along the edges of existing disturbance, such as roadsides and the existing well pad, but are also scattered throughout the adjacent reclaimed area and new pad site.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 14 acres would be disturbed. Following construction completion, 7.92 acres would undergo temporary reclamation seeding. A total of 6 acres would remain as long-term disturbance areas. All of the well pad disturbance would occur on BLM land, while the pipeline disturbance would occur partially on BLM land and partially on private land.

Surface-disturbing activities, such as those proposed for this project, provide a niche for invasion and establishment of non-native plant species particularly when these species are already present in the surrounding area. The mechanisms for invasion and establishment are multi-fold. Removal of native vegetation removes the competition from native plants for resources, including sunlight, water and soil nutrients, creating niches for invasive species (Parendes and Jones 2000). Linear disturbances, such as roads, provide corridors of connected habitat along which invasive plants can easily spread (Gelbard and Belnap 2003). Well pad construction and subsequent well drilling and operations activities require construction equipment and motorized vehicles, which often transport invasive plant seeds either alone or in mud clods on the vehicle undercarriage or tires and deposit them in disturbed habitats along access roads and at well pad sites (Schmidt 1989, Zwaenepoel et. al. 2006).

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 (Hierro et. al. 2006, Reinhart and Callaway 2006, Vinton and Goergen 2006, Vogelsang and Bever 2009). 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 of previous disturbance at the pad site and along associated access roads, several invasive, non-native plant species have become established within and surrounding the proposed project area. With new disturbance from the proposed project, the potential for increased establishment of these undesirable plants following construction activities is high. Vehicles and equipment could also transport new noxious weed species to the site, where they would have disturbed habitats in which to establish. To mitigate this invasive species risk, the standard weed control COA would be attached to APDs to require periodic monitoring and weed control practices to ensure that these weedy plants are controlled (Appendix A). Establishment of native plant species is also important in preventing invasive non-native plant species establishment and spread. Therefore, the standard reclamation COAs would also be attached to APDs to require seeding and monitoring of reclamation seeding results, with recommendations for an appropriate native seed mix (Appendix A). However, portions of the pipeline corridor cross areas of private land ownership. In these areas the reclamation seed mix would be at the landowner's discretion and would not be restricted to native plant species.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. The existing concerns with nonnative invasive species would continue, as would ongoing treatment of noxious weeds.

Native American Religious Concerns

Affected Environment

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

Environmental Consequences

Proposed Action

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

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

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

The National Historic Preservation Act (NHPA) requires that if newly discovered cultural resources are identified during project implementation, work in that area must stop and the agency Authorized Officer notified immediately (36 CFR 800.13). The Native American Graves Protection and Repatriation Act (NAGPRA), requires that if inadvertent discovery of Native American Remains or Objects occurs, activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice made to the agency Authorized Officer, as well as the appropriate Native American group(s) (IV.C.2). Notice may be followed by a 30-day delay (NAGPRA Section 3(d)). Further actions also require compliance under the provisions of NHPA and the Archaeological Resource Protection Act. EnCana Oil & Gas (USA) will notify its staff and contractors of the requirement under the NHPA, that work must cease if cultural resources are found during project operations.

A standard Education/Discovery COA for the protection of Native American values would be attached to the APDs (Appendix A). The importance of these COAs would be stressed to the operator and its contractors, including informing them of their responsibilities to protect and report any cultural resources encountered. The proponent and contractors would also be made aware of requirements under the NAGPRA.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, the No Action Alternative would most likely reduce though not eliminate the potential for accidental damage, vandalism, illegal collection and excavation on the public lands involved.

Noise

Affected Environment

The project area is located in a rural setting approximately 16.4 miles southeast of Rifle, Colorado, and Interstate 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. 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 5) at a distance of 350 feet.

Table 5. Noise Standards for Light industrial, Residential/Agriculture/Rural		
<i>Zone</i>	<i>7:00 A.M. to 7:00 P.M</i>	<i>7:00 P.M. to 7:00 A.M</i>
Light Industrial	70 dBA	65 dBA
Residential/Agricultural/Rural	55 dBA	50 dBA

Given the locations of the proposed project activities, with occupied structures within 1 mile of the pad, the light agricultural 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 14.0-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 6), project-related noise levels would be approximately 59 dBA at a distance of 1,000 feet, approximating active commercial areas (EPA 1974).

Table 6. Noise Levels at Typical Construction Sites and along Access Roads			
<i>Equipment</i>	<i>Noise Level (dBA)</i>		
	<i>50 feet</i>	<i>500 feet</i>	<i>1,000 feet</i>
Air Compressor, Concrete Pump	82	62	56
Backhoe	85	65	59
Bulldozer	89	69	63
Crane	88	68	62
Front End Loader	83	63	57
Heavy Truck	88	68	62
Motor Grader	85	65	59
Road Scraper	87	67	61
Tractor, Vibrator/Roller	80	60	54

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

Traffic noise would also be elevated as a consequence of the Proposed Action. The greatest increase would be along access roads during the drilling and completion phases. Based on the La Plata County data presented in Table 6 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 over 1 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 proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on noise would be lessened, but not eliminated.

Socioeconomics

Affected Environment

Affected Environment

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

The population of the county grew by an average of approximately 2.5% per year from 2000 to 2011 but decreased by 2.6% from 2008 to 2011 due to the national economic downturn, resulting in a net increase

of 27% from 44,259 to 56,270 residents (CDOLA 2013a). Population growth in Garfield County is expected to nearly double to 109,887 in 2040 (CDOLA 2012). In July 2011, the Garfield County population was 70% urban and 30% rural, with a population density of approximately 19 people per square mile (City Data 2012).

In February 2013, the total estimated civilian labor force was 34,107 with an unemployment rate of 7.8% (CDLE 2013). In the fourth quarter of 2011, the industry groups with the highest percentage of total employment were construction (14.04%), retail trade (13.7%), and Health Care and Social Assistance (13.5%). Table 7 lists the top 10 industries in Garfield County for fourth quarter of 2011 (CDLE 2013).

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

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

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

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

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

Property tax revenue from oil and gas development is a source of public revenue in Garfield County. In 2012, oil and gas assessed valuation in Garfield County was approximately \$2.8 billion, or about 73% of

total property tax assessed value distribution (Garfield County 2013b). The county's largest taxpayers are in the oil and gas industry (Garfield County 2013c).

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

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

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

Environmental Consequences

Proposed Action

The Proposed Action would have minor positive impacts on the local economies of Garfield County through the creation or retention of job opportunities in the oil and gas industry and in supporting trades and services. In addition, local governments in Garfield County would experience an increase in tax and royalty revenues. The Proposed Action could result in minor negative social impacts, including reduced scenic quality, increased dust levels, and increased traffic. However, these impacts would be minor and limited to the relatively short duration of drilling and completion activities.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts to socioeconomics—both negative and positive—would be reduced compared to the Proposed Action but not eliminated.

Soils

Affected Environment

The J6SEB project is covered by the *Soil Survey of Rifle Area, Colorado* (NRCS 2010, USDA 1985) and would include surface-disturbing activities on two soil complexes. The well pad and most of the pipeline lies within Ascalon fine sandy loam. The Ascalon fine sandy loam is a well-drained, moderately sloping

(1 to 6% slopes) soil found on terraces, alluvial fans and mesas with elevations ranging from 5,000 to 6,500 feet. This soil is formed in alluvium derived from sandstone and shale. The permeability is moderately rapid, runoff is moderately rapid and erosion hazard is moderate. This soil is generally used for farmland (if irrigated), grazing and wildlife habitat.

The northern portion of the pipeline route traverses two soil types, nearly level Torrifuvents and Torriorthents-Camborthids-Rock outcrop complex. The nearly level Torrifuvents are deep soil formed in floodplain alluvium. Surface layers range from loamy sand to clay loam and underlying layers are sandy to stony loam and clay loam. This soil type supports riparian vegetation where the water table is 2 to 4 feet subsurface

Torriorthents-Camborthids-Rock outcrop complex are exposed sandstone and shale bedrock, loose stones, stony basaltic alluvium and shallow to deep soils formed on foothills and mountainsides. The erosion hazard is moderate to severe and permeability is moderate. This soil complex is generally used for grazing, wildlife habitat and recreation and is unsuitable for crops.

Environmental Consequences

The Proposed Action would involve surface disturbance to construct a new well pad on BLM surface. The Proposed Action would result in approximately 14 acres of short-term vegetation loss and soil compaction and displacement on BLM and private lands. After reclamation the long-term surface disturbance would be reduced to 6 acres. In general, the area that would be affected by the Proposed Action contains adequate vegetation buffers and moderate slopes that would reduce the potential for sediment transport to Dry Hollow Creek and Colorado River. In areas susceptible to erosion or possible slope instability issues proper erosion control and construction techniques and geotechnical analysis may be required in the site specific COAs. Additionally, construction activities would cause mixing of soil horizons, slight to moderate increases in local soil loss, loss of soil productivity, and sediment available for transport to surface waters. Noxious weed infestation resulting from disturbance would impact soil productivity. Potential for such soil loss and transport would increase as a function of slope, feature (pad, road, or pipeline route) to be constructed, and proximity to streams.

Throughout the affected area, the potential would also exist for accidental spills or leaks of petroleum products and hazardous materials during construction, drilling activities and long term operations for the life of the wells. These events would cause soil contamination and may decrease the soil fertility and revegetation potential.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on soils would be similar or slightly less than under the Proposed Action.

Special Status Species

Federally Listed, Proposed, or Candidate Plant Species

Affected Environment

According to the USFWS, four Federally listed plant species may occur within or be impacted by actions occurring in Garfield County. Table 8 lists these species and presents information relative to the project.

Table 8. 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 endemics 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 microbiotic crusts; can occur in dense cheatgrass 4,500 to 6,000 feet	Desert shrubland with shadscale, galleta grass, black sagebrush, Indian ricegrass grading upward into big sagebrush and sagebrush/pinyon-juniper	No	No
Ute lady's tresses orchid (<i>Spiranthes diluvialis</i>) - Threatened	Subirrigated alluvial soils along streams and in open meadows in floodplains; 4,500 to 7,200 feet	Box-elders, cottonwoods, willows, scouring rushes, and riparian grasses, sedges, and forbs	Yes	No

The project area lies within the Shire member of the Wasatch Formation, which is the geologic layer in which DeBeque phacelia occurs. However, the elevation, north-facing exposure, and density of plant cover are not suitable for this species. While potentially suitable areas of barren soils are present near the well pad site, they are too steep and alkaline to support DeBeque phacelia establishment based on habitat delineation guidelines issued by the USFWS (2013). Minor drainages adjacent to the site lack perennial flows, a requirement for Ute lady's tresses, while nearby reaches of Mamm Creek are deeply incised and lack suitable habitat. Therefore, no suitable habitat for any Federally listed plant species exists within or near the proposed project area.

Environmental Consequences

Proposed Action

Because the habitat types in and around the project area are unsuitable for any Federally listed plant species, the No Action Alternative would have “**No Effect**” on these species.

No Action Alternative

Because the habitat types in and around the project area are unsuitable for any Federally listed plant species, the No Action Alternative would have “**No Effect**” on these species.

BLM Sensitive Plant Species

Affected Environment

BLM sensitive plant species with habitat and/or occurrences in Garfield County are listed in Table 9 along with information on typical occurrences, habitat associations, potential for occurrence in the project area based on known geographic range and habitat requirements, and potential for being affected by the Proposed Action.

Only one sensitive species, Harrington’s penstemon, has the potential to occur in the project vicinity. However, the basalt rock typically present with this species is lacking in the project area, and the deeper silty and sandy clay soils present at the site are not suitable for this species. Therefore, no suitable habitat for any BLM sensitive plant species exists within or near the project area.

Table 9. Potential for Occurrence of BLM Sensitive Plant Species				
<i>Species</i>	<i>Occurrence</i>	<i>Habitat Association</i>	<i>Range or Habitat in Vicinity?</i>	<i>Potentially Affected?</i>
DeBeque milkvetch (<i>Astragalus debequaeus</i>)	Varicolored, fine-textured, seleniferous or saline soils of Wasatch Formation; 5,100 to 6,400 feet	Pinyon-juniper woodlands and desert shrub.	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 endemic species	No	No
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 to 9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	Yes	No
Cathedral Bluffs meadow-rue (<i>Thalictrum heliophilum</i>)	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300 to 8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

Environmental Consequences

Proposed Action

No occurrences of BLM sensitive plants or potential habitat are known or anticipated in locations within or adjacent to the project area. Therefore, the project would have no impact on BLM sensitive plants.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. However, no BLM sensitive plant species are known to occur within or near the project area. Therefore, the No Action Alternative would have no adverse impacts on any BLM sensitive plant species.

Federally Listed, Proposed, or Candidate Animal Species

Affected Environment

Eight species of Federally listed, proposed, or candidate threatened or endangered vertebrate species occur within Garfield County or may be affected by projects within the County. These species, their status, and their distributions and habitat associations in the region are listed in Table 10.

Table 10. Potential for Occurrence of Threatened or Endangered Animal Species				
<i>Species and Status</i>	<i>Distribution in Region</i>	<i>Preferred Habitats</i>	<i>Potentially Present in Vicinity?</i>	<i>Potentially Adversely Affected?</i>
Canada lynx (<i>Lynx canadensis</i>) – Threatened	Dispersed use in in upper montane and subalpine zones of Colorado mountains.	Subalpine spruce-fir forests; also lodgepole pine and aspen to as low as upper montane.	No	No
Yellow-billed cuckoo (<i>Coccyzus americanus</i>) –Candidate	Major rivers and tributaries of western, northwestern, and south-central Colorado.	Large cottonwood stands with tall shrub understory along rivers.	No	No
Mexican spotted owl (<i>Strix occidentalis lucida</i>) – Threatened	No historic occurrence in area; present in southwestern Colorado and southern Front Range.	Rocky cliffs in canyons with closed-canopy coniferous forests.	No	No
Razorback sucker (<i>Xyrauchen texanus</i>) – Endangered	Mainstem Colorado River and major tributary rivers – upstream to town of Rifle in CRVFO.	General: Deep, slow runs, pools, and eddies. Spawning: silt to gravel substrates in shallow water and seasonally flooded overbank areas.	Yes	Yes
Colorado pikeminnow (<i>Ptychocheilus lucius</i>) – Endangered			Yes	Yes
Humpback chub (<i>Gila cypha</i>) -- Endangered	Mainstem Colorado River and major tributaries – upstream to Black Rocks near Utah state line.	Rocky runs, riffles, and rapids in swift, deep rivers.	No	Yes
Bonytail chub (<i>Gila elegans</i>) – Endangered			No	Yes

"Lineage GB" cutthroat trout (<i>Oncorhynchus clarki</i> ssp.) – Threatened	Identified in 60 streams in Colorado River basin including CRVFO area.	Clean, cool headwaters streams and ponds isolated from other strains of cutthroat trout.	No	No
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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. 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 on the Colorado River west of Grand Junction, is known to exist in Colorado.

Environmental Consequences

Proposed Action

The Canada lynx, Mexican spotted owl, and western yellow-billed cuckoo are not expected to occur in the project vicinity based on habitat types present in the area and location of documented occurrences. 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 0.7 acre-feet of Colorado River water is consumed during activities related to each oil and gas well.

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 will 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 on the well pads, associated with ancillary surface facilities, or resulting from an accident involving a haul truck in proximity to a stream.

Stormwater controls required for the protection of surface water quality would also provide protection of aquatic organisms (see COAs in Appendix A). Even if sediment inflow were to occur, including incidental aerial deposition of fugitive dust from roadways and construction areas, these fishes are adapted to the naturally high sediment loads that characterize the Colorado River and its tributaries.

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations were 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, the operator is required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by BLM or the State. In addition, the stormwater controls (see COAs in Appendix A) would reduce the risk of transport of these substances as well as sediments to surface waters, including the Colorado River. For these reasons, and because any spills making their way 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 proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on Federally listed, proposed, or candidate animal species would be less than under the Proposed Action but not eliminated.

BLM Sensitive Animal Species

Affected Environment

BLM sensitive animal species with habitat and/or occurrence records in the portion of the CRVFO that includes the project area and vicinity are listed in Table 11. Species indicated in the table as present or possibly present in the project vicinity are described more fully following the table.

Table 11. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Fringed myotis (<i>Myotis thysanodes</i>)	Roosting: Caves, trees, mines, and buildings. Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
Townsend’s big-eared bat (<i>Corynorhinus townsendii</i>)		
Northern goshawk (<i>Accipiter gentilis</i>)	Montane and subalpine coniferous forests and aspen forests; may move to lower elevation pinyon/juniper woodland in search of prey during winter.	Possible in winter
Bald eagle (<i>Haliaeetus leucocephalus</i>)	Nesting/Roosting: Mature cottonwood forests along rivers. Foraging: Fish and waterfowl along rivers and lakes; may feed on carrion, rabbits, and other foods in winter.	Nests and roosts along Colorado River
Peregrine falcon (<i>Falco peregrinus</i>)	Nesting: Cliffs, usually near a river, large lake, or ocean. Foraging: Waterfowl on rivers and lakes; upland fowl in open grassland or steppe.	Nests on Roan Cliffs
Brewer’s sparrow (<i>Spizella breweri</i>)	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Possible – habitat marginal

Table 11. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area		
<i>Common Name</i>	<i>Habitat</i>	<i>Potential for Occurrence</i>
Midget faded rattlesnake (<i>Crotalus oreganus concolor</i>)	Cold desert of NW Colorado, SW Wyoming, and NE Utah, primarily in sagebrush with rock outcrops and exposed canyon walls.	No suitable habitat
Great Basin spadefoot (<i>Spea intermontana</i>)	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	No suitable habitat
Northern leopard frog (<i>Lithobates pipiens</i>)	Clean, perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Habitat marginal, species not observed
Bluehead sucker (<i>Catostomus latipinnis</i>)	Primarily smaller streams with a rock substrate and mid to fast-moving waters; also shallows of larger rivers.	Not present
Flannelmouth sucker (<i>Catostomus discobolus</i>)	Runs, riffles, eddies, and backwaters in large rivers.	Present in Colorado River
Roundtail chub (<i>Gila robusta</i>)	Slow-moving waters adjacent to fast waters in large rivers.	
“Lineage CR” cutthroat trout (<i>Oncorhynchus clarki</i> ssp.)	Headwaters streams and ponds with cool, clear waters isolated from populations of non-native cutthroats and rainbow trout.	Not present

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. No new loss of habitat above which the bats could search for aerial prey would occur, and the area they might avoid during nighttime drilling and completion activities would represent a small portion of their total feeding range, if present.

Northern Goshawk – This species is mostly limited to spruce/fir or aspen forests, such as atop the Roan Plateau, Battlement Mesa, and other areas that reach subalpine elevations. However, goshawks may migrate to lower elevation pinyon/juniper or Douglas-fir habitats during winter and therefore could make occasional, transitory use of the project area for winter foraging. Goshawks feed primarily on small birds but also on diurnal small mammals (rabbits, chipmunks, etc.).

Bald Eagle – Formerly listed as endangered, then downlisted to threatened and subsequently removed from the list of threatened or endangered species, the bald eagle remains protected by the Bald and Golden Eagle Protection Act (BGEPA) as well as the MBTA. Bald eagles nest and roost along the Colorado and most likely occasionally venture into the Parachute Creek drainage for hunting activities. Bald eagles hunt primarily for fish and waterfowl but secondarily for rabbits, ground squirrels, or other upland prey, especially in winter. Any use of the West Fork Parachute Creek canyon by this species would be expected to be infrequent and transitory.

Peregrine Falcon – Also formerly listed as endangered, then downlisted to threatened and subsequently removed from the list of threatened or endangered species, the peregrine falcon nests along the Roan Cliffs in the general project vicinity and hunts primarily for waterfowl along the Colorado River or upland fowl and other birds on nearby sagebrush-covered plateaus. No peregrine nests are known near the

project area, and Mamm Creek is not suitable hunting habitat due to its small sizes and dense tree cover. Peregrines may hunt for birds on the sagebrush slopes of the canyon sides.

Brewer's Sparrow – This species is a near-obligate on sagebrush and is common in expansive stands, especially those dominated by Wyoming big sagebrush on level to rolling or undulating terrain. Smaller stands or those on steep mountainsides may also be used, and the species occasionally nests in stands of short willows near timberline. The sagebrush habitat on the sideslopes of the project area is marginally suitable for nesting by this Neotropical migrant.

Flannelmouth Sucker and Roundtail Chub – As with the endangered Colorado River fishes described in the section of threatened or endangered species, the flannelmouth sucker and roundtail chub are vulnerable to alterations in flow regimes in the Colorado River that affect the availability and suitability of spawning sites and habitats needed for development of the larvae. The amount of consumptive water use associated with the Proposed Action would not be expected to cause discernible impacts to flows in the Colorado River. Similar to the endangered big-river fishes, these species are adapted to naturally high sediment loads and therefore would not be affected by increased sediment transport to the Colorado River. However, they are vulnerable to inflow of sediments into smaller streams, smothering the eggs. The potential for adverse impacts from inflow of chemical pollutants is also greater in small streams due less dilution and the presence of larval or juvenile fishes, which are more susceptible to mortality from acute toxicity. COAs for the protection of water quality (Appendix A) would minimize the potential for impacts from inflow of sediments or toxicants. Prompt implementation of the SPCC plan following any spill or other release of hydrocarbons, saline waters, or other contaminants would further reduce the risk of significant adverse impacts to these species and other aquatic life in affected waters.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on BLM sensitive animal species would be less than under the Proposed Action but not eliminated.

Vegetation

Affected Environment

The project site lies at the upper edge of the pinyon-juniper habitat type, grading into mountain shrub and Gambel's oak habitat at 7,160 feet in elevation. The pad itself would be constructed within a sagebrush and grassland meadow rimmed by Gambel's oak (*Quercus gambelii*), pinyon pine (*Pinus edulis*), Utah juniper (*Juniperus osteosperma*), bitterbrush (*Purshia tridentata*), serviceberry (*Amelanchier utahensis*), and snowberry (*Symphoricarpos rotundifolius*). Vegetation within the meadow is dominated by native perennial grasses such as Sandberg bluegrass (*Poa secunda*), slender wheatgrass (*Elymus trachycaulus*), thickspike wheatgrass (*Elymus lanceolatus*), and western wheatgrass (*Pascopyrum smithii*), as well as non-native range grasses such as crested wheatgrass (*Agropyron cristatum*) and smooth brome (*Bromus inermis*).

Native shrubs at this location include broom snakeweed (*Gutierrezia sarothrae*), longflower rabbitbrush (*Chrysothamnus depressus*), mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), rubber rabbitbrush (*Ericameria nauseosa*), and shadscale (*Atriplex confertifolia*). Native forbs include white sagebrush (*Artemisia ludoviciana*), dusty beardtongue (*Penstemon comarrhenus*), curlycup gumweed (*Grindelia squarrosa*), hairy false golden-aster (*Heterotheca villosa*), lupine (*Lupinus* sp.), Osterhout's penstemon (*Penstemon osterhoutii*), Rocky Mountain penstemon (*Penstemon strictus*), scarlet gilia

(*Ipomopsis aggregata*), scarlet globemallow (*Sphaeralcea coccinea*), showy goldeneye (*Heliomeris multiflora*), and tansy-aster (*Machaeranthera canescens*).

The pipeline corridor drops down from the well pad site through pinyon-juniper and mountain big sagebrush habitats to an elevation of 6,880 feet. Plant species diversity along the pipeline corridor is similar to that at the well pad site, but with increasing densities of pinyon-juniper and fewer mountain shrub species at lower elevations. Also, because the pipeline would follow along an existing road, numerous non-native invasive species are present along this corridor. These include the field brome, common dandelion, flixweed, kochia, lamb's quarters, prickly lettuce, prostrate knotweed, Russian-thistle, meadow salsify, tall tumble-mustard, and yellow sweetclover (see the earlier section on Invasive Non-Native Species). These invasive non-natives are also established at the existing J6SE well pad, immediately adjacent to the proposed J6SEB pad site.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 14 acres would be disturbed, of which approximately 6 acres would remain as long-term disturbance. Of the 14 acres of total disturbance, 7.4 acres of meadow and mountain big sagebrush vegetation would be removed at the well pad site, and 6.6 acres of meadow, mountain big sagebrush, pinyon-juniper woodland, and mountain shrub vegetation would be removed along the pipeline corridor. All of the well pad disturbance, and part of the pipeline disturbance, would occur on BLM land. The remainder of the pipeline disturbance would occur on private land. On the BLM portions, reclamation seedings would consist of native plant species, while on the private land areas the reclamation seed mix would be at the discretion of the landowner.

Native vegetation surrounding the project area would not be directly impacted, but could be indirectly impacted by dust. Dust can negatively impact plants by clogging stomatal openings in the leaves, impeding gas exchange in the leaves and reducing the ability of plants to take in carbon dioxide (Sharifi et. al. 1997). Dust on the leaf surface can also effectively reduce light availability at the leaf surface (Thompson et. al. 1984). Light and carbon dioxide are both critical for plants to conduct photosynthesis, and reductions in either can reduce the quantity of carbohydrates plants can produce through photosynthesis, and thereby reduce plant growth and seed production (Wijayratne et. al. 2009). Dust levels could be expected to increase above ambient levels in the short term from pad construction and drilling, and in the long term from the exposed bare ground surface of the working pad and vehicle traffic associated with well operation. Increased dust could reduce growth rates and seed production in neighboring plants.

Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native invasive plant species. Ground disturbance provides excellent habitat for invasive species, particularly when these species are already present on the site as is the case for this project. Construction equipment and vehicles entering the site from elsewhere also provide potential vectors for introducing new invasive species. Because of the previous disturbance history and nonnative invasive species establishment in the surrounding vegetation, it would be particularly vulnerable to new noxious weed infestations. Implementation of standard COAs for noxious weeds and temporary reclamation (Appendix A) would reduce the risk of noxious weed and invasive species establishment and spread, but non-native species could be expected to persist on this site due to their current widespread establishment here combined with the new disturbance to the existing vegetation. In this case, they could move beyond the disturbance area to neighboring undisturbed vegetation where bare ground habitat is available.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on vegetation would be less but not eliminated.

Visual Resources

The Proposed Action would occur on BLM land approximately 10 air-miles southeast of Rifle. The BLM land is classified as visual resource management (VRM) Class II as identified by the 1984 Glenwood Springs Resource Management Plan (Figure 5). The objective for VRM Class II, as defined by the BLM's Manual H-8410-1 – Visual Resource Inventory (BLM 1986), is as follows:

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

The Proposed Action is located within Visual Resource Inventory Class II (predominant) and Class III, Scenic Quality B, Sensitivity High, and within the Foreground/Middle Ground (predominant) and Background Distance Zones.

The Proposed Action would occur on a finger-like ridge descending northeast from Bald Mountain in the Grand Mesa National Forest. The project area is bound by East Mamm Creek to the west and north, Dry Hollow Creek to the east, and Dry Hollow Creek and private land to the south. The area is characteristic of scattered rural agricultural/ranching land and oil and gas development. Vegetation consists predominantly of sagebrush flats/grassland meadows intermixed with dense patches of mixed oak brush/mountain shrubland communities. The proposed J6SEB pad would be located within one of the sagebrush flat-grassland meadow mosaics surrounded by mixed oakbrush-mountain shrublands along the northwest, southwest, and southeast edges of the well pad and access road. Man-made modifications are present in the area and include existing two-track roads, well pads with associated production facilities, and ranching/grazing infrastructure (gates and fences).

The visual resource analysis area includes CR 315 (Mamm Creek Road), the existing J6SE well pad, and the proposed J6SEB pad location (Figure 5). The typical casual observer in this area would include people who ranch, recreate, and work in the oil and gas industry. There is no public access available to the project location. The parcel of BLM land where the Proposed Action is located is landlocked by private land. The BLM land in this general area is known as the Reservoir Gulch/Mud Hill Area. This area can only be accessed through the White River National Forest and the Grand Mesa National Forest to the south and is used predominantly during hunting season. This area would not get a lot of visual exposure because of its inaccessibility, but it does have high visual sensitivity.

BLM guidance states that lands with high visual sensitivity are those within 5 miles of a primary travel corridor and of moderate to very high visual exposure, where details of vegetation and landform are readily discernible and changes in visual contrast are easily noticed by the casual observer. The visual impact analysis for this project is based on the views from four Key Observation Points (KOPs) representing one linear and three stationary viewing locations representing the viewing angle and direction with the highest frequency of viewers.

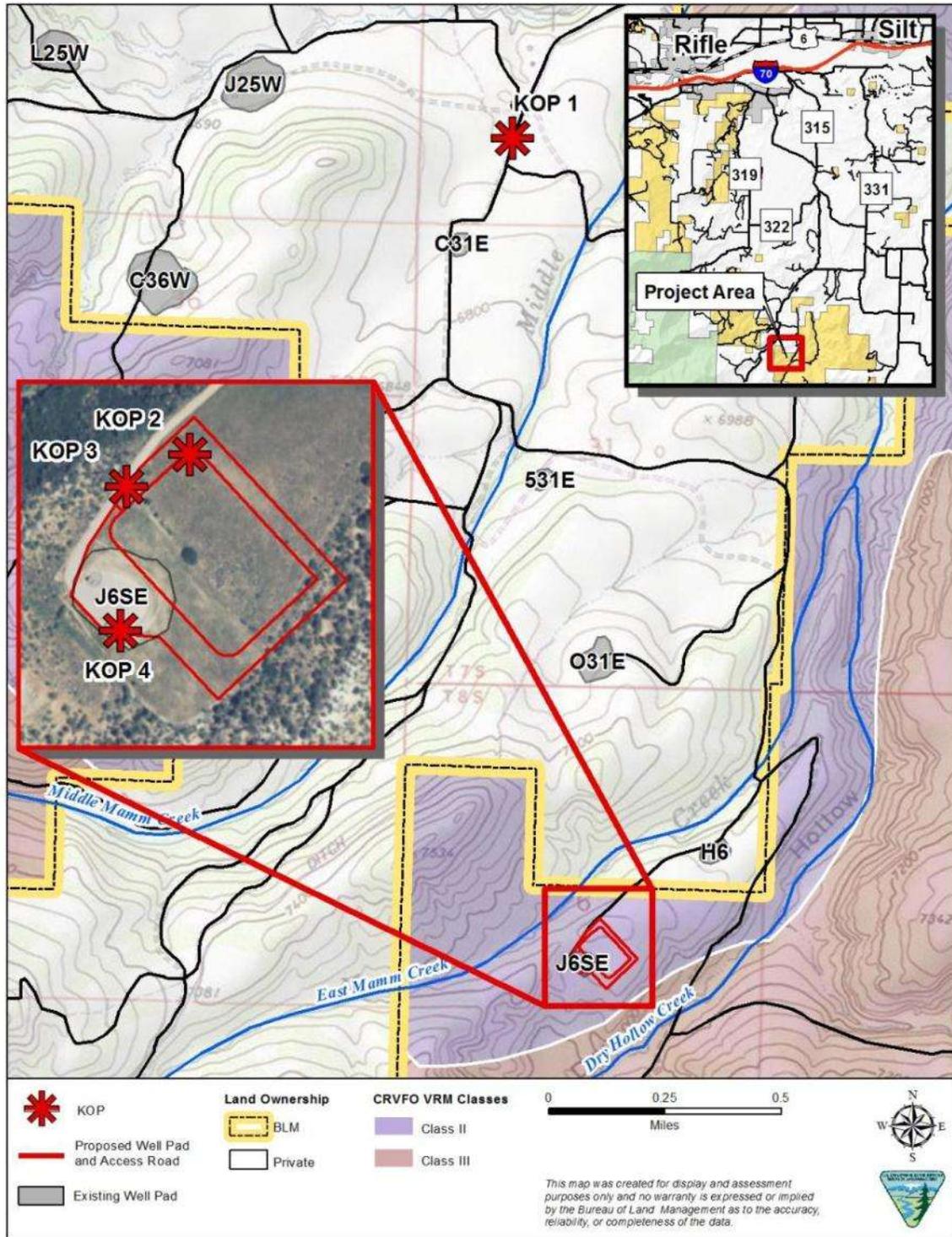


Figure 5. Proposed Action Relationship to VRM Class Designations.



Figure 6. KOP 1 – View Southeast from CR315 (Mamm Creek Road). The viewer would be slightly lower than the Proposed Action from this location. The Proposed Action would be screened from view by the topography directly behind the drill rig (existing Encana 531E pad).



Figure 7. KOP 2 – View south from the north corner of the proposed J6SEB pad. The viewer would slightly higher than the Proposed Action due to an 18-foot cut slope at this corner. Note that the existing J6SE pad sits just to the south of the proposed J6SEB pad, just below the single tree in the middle ground and right of center in the photo). Dry Hollow drainage and the White River and Grand Mesa National Forest lands are in the background.



Figure 8. KOP 3 – View south from the J6SE access road. The viewer would be slightly higher than the Proposed Action from this location due to a 16-foot cut slope to the left of the fence line. The existing J6SE pad sits at photo center.



Figure 9. KOP 4 – View northeast from the existing J6SE pad. The viewer would be slightly lower than the Proposed Action from this location due to a 13-foot fill slope in the immediate foreground. The center of the proposed J6SEB pad would be near the single tree at photo center.

Environmental Consequences

Proposed Action

The planning process involved a site visit to review the layout location for the well pad, production facilities, cuttings management, access road, and pipeline. The original proposal was to expand the J6SE well pad from its current location. However, due to topographic and drainage constraints Encana proposed moving the pad north (reflected in APD plats) where the terrain would be more accommodating and the area of disturbance would not encroach the drainages immediately to the southwest and southeast of the existing J6SE well pad.

The existing J6SE well pad separator and tank would be relocated to the proposed J6SEB pad. This would accommodate a smaller production surface working area on the J6SE pad. The existing J6SE pad

would be recontoured and seeded closer to the existing well head, creating a smaller footprint and providing a vegetated buffer from the drainage to the south.

The proposed J6SEB pad, access road, and pipeline would create visual contrast within the immediate landscape removing existing vegetation, exposing bare ground, and creating a series of distinct lines and colors in the landscape. Such visual changes would be the most evident during construction and completion activities. Once the well pad is put into production and the pad is recontoured and vegetation is reestablished, the overall visual contrast and texture of the site would be expected to blend with the surroundings. Short-term visual impacts would include the presence of drilling rigs, heavy equipment (e.g., dozers, graders, etc.), and vehicular traffic with an associated increase in dust, light pollution, and well flaring.

The well pad would be constructed with a maximum 18-foot cut slope at the north corner and a maximum 18-foot fill slope at the south corner. The total short-term surface disturbance for the well pad, access/entrance road and pipeline would amount to approximately 14 acres. Following drilling and completion operations, the total disturbed area on BLM land would be reduced to a long-term production working surface of 6 acres after interim reclamation.

The Proposed Action would be visible but would not attract attention because of its inaccessibility. To meet VRM Class II objectives, mitigation requirements are applied as COAs (See Appendix A).

No Action Alternative

Under this alternative, no development of Federal wells would occur on BLM land precluding any new visual impacts relating to drilling, completing, servicing or producing Federal wells or gas gathering operations.

Wastes, Hazardous or Solid

Affected Environment

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

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

- The Oil Pollution Act (Public Law 101-380, August 18, 1990) prohibits discharge of pollutants into Waters of the US, which by definition would include any tributary, including any dry wash that eventually connects with the Colorado River.

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510 of 1980) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment. It also provides national, regional, and local contingency plans. Applicable emergency operations plans in place include the National Contingency Plan (40 CFR 300, required by section 105 of CERCLA), the Region VIII Regional Contingency Plan, the Colorado River Sub-Area Contingency Plan (these three are Environmental Protection Agency-produced plans), the Mesa County Emergency Operations Plan (developed by the Mesa County Office of Emergency Management), and the BLM Grand Junction Field Office Hazardous Materials Contingency Plan.
- The Resource Conservation and Recovery Act (RCRA) (Public Law 94-580, October 21, 1976) regulates the use of hazardous substances and disposal of hazardous wastes. Note: While oil and gas lessees are exempt from RCRA, ROW holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

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

Environmental Consequences

Proposed Action

Possible pollutants that could be released during the construction phase of this project would include diesel fuel, hydraulic fluid, and lubricants. These materials would be used during construction of the pads, roads, and pipelines, and for refueling and maintaining equipment and vehicles. Potentially harmful substances used in the construction and operation phases would be kept onsite in limited quantities and trucked to and from the site as required. No hazardous substance, as defined by 40 CFR 355 would be used, produced, stored, transported, or disposed of in amounts above threshold quantities.

Waste generated by construction activities would not be exempt from hazardous waste regulations under the oil and gas exploration and production exemption of RCRA. Exempt wastes would include those associated with well production, transmission of natural gas through gathering lines, and natural gas itself.

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

Solid waste (human waste, garbage, etc.) would be generated during construction activities and, to a 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. Pollutants that might be released during the operational phase of the project could include condensate, produced water (if the wells in the area produce water) and glycol (carried to the site and used as antifreeze). While uncommon, an

accident could occur that could result in a release of any of these materials. A release could result in contamination of surface water or soil. Improper casing and cementing procedures could result in the contamination of groundwater resources. In the case of any release, emergency or otherwise, the responsible party would be liable for cleanup and any damages. Depending on the scope of the accident, any of the above referenced contingency plans would be activated to provide emergency response. At a minimum, the BLM Grand Junction Field Office contingency plan would apply.

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

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts to wastes would be lessened, but not eliminated.

Water Quality, Surface and Ground

Surface Water

Affected Environment

The Proposed Activities for J6SEB pad would occur within East Mamm Creek unit which empties to the Colorado River 5 miles to the north of the project. The pad and pipeline are located between East Mamm Creek and Dry Hollow Creek. Some of the project area drains to Dry Hollow Creek and the pipeline route drains to Dry Hollow Creek. Dry Hollow Creek empties into East Mamm Creek 1 mile north of the project. East Mamm Creek flows northeast into Mamm Creek approximately 2 miles to the northeast of the project. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007), the project lies within two stream segments. The areas that drain to East Mamm Creek and away from Dry Hollow Creek 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. The tributaries to and the mainstem of Dry Hollow Creek are within segment 4d. The following are descriptions of 4d and 4e.

- Segment 4e – This segment has been classified aquatic life cold 2, recreation N 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 agricultural purposes that include irrigation and livestock use.
- Segment 4d – This segment has been classified as 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, however, suitable or intended to become suitable for potable water supplies and agricultural purposes that include irrigation and livestock use.

The segment of the Colorado River which East Mamm Creek and Dry Hollow Creek drains is 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. However, no streams within segment 4e are on this list. *Colorado’s Monitoring and Evaluation List* identifies waterbodies where there is reason to suspect water quality problems, but uncertainty also exists regarding one or more factors. The USGS has not collected surface water data at sites along Dry Hollow Creek near the project area (USGS 2007). Data from the Colorado River below the project area near Rulison in 1977 and 1978 are show in Table 12.

No sediment measuring stations are present on the Colorado River or its tributaries near the pad location. The closest downstream station on the Colorado River is near DeBeque, Colorado. A summary of USGS data collected at this station indicates that the mean sediment load was 1,817 tons per day during the period of 1974 to 1976. The maximum and minimum for this location during the same period was 41,300 and 8 tons/day respectively (USGS 2007).

Table 12. Selected Water Quality Data for Two Nearby Sampling Locations on the Colorado River		
<i>Parameter</i>	<i>USGS Site #09092570</i>	<i>USGS Site #09092570</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
Note: NA = data not available. Source: USGS 2007.		

Environmental Consequences

Proposed Action

The Proposed Action would result in 14 acres of surface disturbance of which approximately 6 would not be reclaimed during the life of the wells. Potential impacts to surface water associated with the Proposed Action occur from surface-disturbing activities, traffic, waste management, and the use, storage and transportation of fluids (i.e., chemicals, condensate, and produced water). Surface-disturbing activities associated with well and facility pads, roads, and pipelines cause loss of vegetation cover, soil compaction and displacement, increased volume and velocity of runoff, and increased sedimentation and salinity in surface waters.

Impacts can be minimized by stormwater management, stockpiling topsoil, controlling erosion, rehabilitation of disturbed surfaces quickly. Long term soil protection could be achieved by continued road and pad maintenance to reduce erosion, remediation of contaminated soils and minimizing the size of the long-term pad footprint through interim reclamation measures. As proposed, these measures would include limiting cut slope steepness, step-cutting, crowning road surfaces, installing culverts and

drainage systems, and applying gravel to all upgraded BLM roads in the project area to a compacted thickness of 6 inches (Appendix A).

Oil and gas waste management practices have the potential to contaminate soils and surface water. Contamination of soils could cause long-term reduction in site productivity resulting in increased erosion and potential sediment and contaminant delivery to nearby waterways during runoff. Use, storage, and transportation of fluids such as produced water, hydraulic fracturing fluids, and condensate have the possibility of spills that could migrate to surface or groundwater. Elements of the Proposed Action are designed to mitigate risks to surface waters associated with the release and migration of drilling fluids, produced water, and condensate. A closed-loop drilling system would be implemented which recycles drilling fluids; cuttings would be dried through the use of a shaker system, decontaminated to COGCC standards and be stacked against the cut slope on the pad. A traditional reserve pit would not be constructed. Completions may be conducted either onsite or remotely and fluids may be stored in surface containment or a pit. An on or offsite engineered completions pit may be constructed to store water for hydraulic fracturing and recycle flowback water. These pits are engineered with double lining and leak detection systems. To achieve successful closure of the pit the soils below the lining must pass COGCC standards and the hole must be backfilled with decontaminated cuttings and/ or clean fill.

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on surface waters would be less than under the Proposed Action.

Waters of the U.S.

Affected Environment

Waters of the U.S. located in the project vicinity include the mainstem and tributaries of Dry Hollow Creek and East Mamm Creek. Section 404 of the Clean Water Act requires a Department of the Army permit from the U.S. Army Corps of Engineers (USACE) prior to discharging dredged or fill material into waters of the U.S. as defined by 33 CFR Part 328. A permit is required for both permanent and temporary discharges into waters of the United States; larger discharges require an individual permit, while smaller discharges may be granted a Nationwide Permit (NWP). Any fill into a drainage which is considered a Waters of the U.S. would require a USACE permit.

Environmental Consequences

Proposed Action

No new crossings of waters of the U.S. are included in the Proposed Action, nor is pad construction proposed that could discharge fill into Waters of the U.S.

No Action Alternative

The No Action alternative would constitute denial of the Federal wells as proposed. However, daily operations would still continue on the existing J6SE pad.

Groundwater

Affected Environment

The Lower Piceance Basin contains both alluvial and bedrock aquifers (Colorado Geological Survey 2003). Unconsolidated alluvial aquifers are the most productive aquifers in the region (EPA 2004) and are defined as narrow, thin deposits of sand and gravel formed primarily along stream courses, in this case, along the Colorado River and its tributaries. Alluvial well depths are generally less than 200 feet and water levels typically range between 100 to 150 feet. Well yield is dependent upon the intended use of the well, well construction design, sediment type and saturated thickness. Domestic use wells are limited to 15 gallons per minute (gpm) administratively, while municipal wells are designed and constructed for maximum potential yield.

The principal bedrock aquifers of the Piceance Basin are the Uinta Formation and the Parachute Creek Member of the Green River Formation, and are defined as the upper and lower Piceance Basin aquifer systems. The Uinta Formation consists of discontinuous layers of sandstone, siltstone, and marlstone and is less permeable than the hydrologically connected upper Parachute Creek Member (Robson and Saulnier 1981). The uppermost Uinta Formation also contains a shallow, perched aquifer that is separate from the upper aquifer unit (Cole et al. 1995). The upper Piceance Basin aquifer is underlain by the Mahogany confining unit, and correlates with the Mahogany Zone, the principal oil shale unit of the Piceance Basin. The Mahogany Zone separates the upper aquifer from the lower. The lower aquifer consists of the fractured marlstone of the lower part of the Parachute Creek Member. The thickness of the upper and lower aquifer units average 700 and 900 feet, respectively (CGS 2003). Both upper and lower aquifer systems are found within the surrounding cliffs of the project area, but no water wells are completed within either the upper or lower bedrock aquifers units as described above. Beneath these two aquifer systems is a confining unit which consists of the lower two members of the Green River Formation, and the Wasatch Formation. Although considered a confining unit, some fresh water wells are completed in the discontinuous water-bearing sands of the Wasatch Formation, but these water-bearing intervals are considered to be localized.

Below the Wasatch Formation is the Cretaceous-aged Mesaverde aquifer. The depth to the top of this aquifer beneath the project area is more than 5,000 feet below ground surface (bgs), far too deep for economic development. The Mesaverde aquifer is of regional importance, but does not provide recharge into the fresh water system within the shallower groundwater system of the project area.

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

presence of nahcolite deposits and salt beds throughout the basin. Only very shallow waters such as those from the surficial Wasatch Formation are used for drinking water (Graham 2001, cited in EPA 2004).

No permitted freshwater domestic-use wells currently exist within a 2-mile radius of the proposed project area.

Environmental Consequences

Proposed Action

Potential impacts to groundwater resources from the proposed development would include contamination of the groundwater with produced water, drilling mud, and petroleum constituents. Hydraulic fracturing would be incorporated to create additional pathways to facilitate gas production. Agents called proppants” used to prop open the fractures are mixed with both fresh water and produced water. Typical proppants include sand, aluminum, glass, or plastic beads, with less than 1% of other compounds such as corrosion-, friction-, and scale-inhibitors (EnerMax Inc. 2007). Fracing techniques are used to create secondary porosity fractures, held open by proppants, allowing the otherwise trapped gas to migrate up the borehole for production.

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

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on groundwater resources would be less than under the Proposed Action but not eliminated.

Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

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

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

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

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

In addition to vertical separation of several thousand feet between the upper extent of fractures and fresh-water aquifers are requirements by the BLM and COGCC for proper casing and cementing of wellbores to isolate the aquifers penetrated by a wellbore. BLM requires that surface casing be set from 800 to 1,500 feet deep, based on a geological review of the formations, aquifers, and groundwater. Cement is then pumped into the space between the casing and surrounding rock to prevent fluids from

moving up the wellbore and casing annulus and coming in contact with shallow rock layers, including fresh-water aquifers. BLM petroleum engineers review well and cement design and final drilling and cementing logs to ensure that the cement has been properly placed. When penetration of groundwater and freshwater aquifers is anticipated, BLM inspectors may witness the cementing of surface casing and subsequent pressure testing to ensure that the annular space 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 13). Since hydraulic fracturing is tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 13 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 13 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 approximately 99.5% of the total by volume in the typical mixture shown in Table 13. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

Table 13. 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		99.5		
*FracFocus Chemical Disclosure Registry, fracfocus.org/chemical-use/what-chemicals-are-used. **DOE 2009				

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

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 proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on geology and minerals would be less than under the Proposed Action but not eliminated.

Wildlife – Aquatic Species

Affected Environment

Aquatic habitat is limited in the project area given the intermittent nature of the streams. East Mamm Creek lies approximately 0.1 mile to the west of the J6SE pad. Although East Mamm Creek is a perennial stream, it is limited in terms of aquatic wildlife primarily by sediment load and flows which are flashy and seasonally low. Fish surveys by Colorado Parks and Wildlife (CPW) have documented the presence of speckled dace (*Rhinichthys osculus*)—a bottom-dwelling species in shallow, rocky, headwater streams with relatively swift flow—in the upper reaches of East Mamm Creek. Dry Creek, an ephemeral drainage lies approximately 0.5 mile from the pad. No fish occur in Dry Creek due to its small size and limited water flow.

Aquatic macroinvertebrates living in perennial streams such as East Mamm Creek during a portion of their lifecycles include larvae of stoneflies, mayflies, and some caddisflies in fast-flowing reaches with rocky or detrital substrates. In slow-flowing portions of East Mamm Creek with fine substrates, aquatic macroinvertebrates probably include the larvae of midges, mosquitoes, and some caddisflies. These

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

Environmental Consequences

Proposed Action

Habitat for the present fish population would remain adequate by maintaining the present condition of the aquatic and riparian environment of East Mamm Creek. Runoff from the well pads is adequately buffered given the distance to the creek. Additionally, protective COAs for water quality would minimize potential impacts from the development. (Appendix A)

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts on aquatic wildlife would be less the Proposed Action but not eliminated.

Wildlife – Migratory Birds

Affected Environment

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 bird species, nesting habitat is of special importance because it is critical for supporting reproduction in terms of nesting and foraging sites. 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.

Emphasizing the need to conserve declining migratory bird species, the U.S. Fish and Wildlife Service (USFWS 2008) has published a list of Birds of Conservation Concern (BCC). The current BCC list includes 10 species potentially present in or near the project area: the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), prairie falcon (*Falco mexicanus*), flammulated owl (*Otus flammeolus*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis’s woodpecker (*Melanerpes lewis*), willow flycatcher (*Empidonax traillii*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus griseus*), Brewer’s sparrow (*Spizella breweri*), and Cassin’s finch (*Haemorhous cassinii*). The flammulated owl and Brewer’s sparrow are also listed as BLM sensitive species and addressed in the section on Special Status Species.

This section focuses on BCC species, non-BCC species that are Neotropical (long-distance) migrants, and raptors—three groups especially vulnerable to habitat loss or modification on their breeding grounds. Species protected under the Endangered Species Act or classified by the BLM as sensitive species are addressed in the section on Special Status Species.

Pinyon-juniper habitat provides potential nesting sites for the pinyon jay, juniper titmouse, and (less likely based on range) the gray vireo. Cassin’s finch nests at higher elevations in montane and subalpine

conifers but may move into pinyon-juniper in winter. Non-BCC species potentially nesting in pinyon-juniper in the project area include Neotropical migrants such as the black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), Dusky flycatcher (*Empidonax oberholseri*), mountain bluebird (*Sialis currucoides*), western bluebird (*S. mexicana*), blue-gray gnatcatcher (*Polioptila caerulea*), plumbeous vireo (*Vireo plumbeus*), black-throated gray warbler (*Dendroica nigrescens*), and chipping sparrow (*Spizella passerina*) along with other migrants such as the American robin (*Turdus migratorius*).

Sagebrush shrublands in the project area provide marginal habitat for the Brewer's sparrow, a near-obligate in sagebrush shrublands. Non-BCC species associated with sagebrush shrublands include the western meadowlark (*Sturnella neglecta*) and three species of Neotropical migrants: western kingbird, vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*). Additionally, two active golden eagle nests were found in the cliff bands north of the proposed well pads.

Raptors most likely to nest in the project vicinity and forage in or near the project area include two BCC species—the golden eagle and prairie falcon. 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*) are more likely to occur in the project area.

Environmental Consequences

Proposed Action

Under the Proposed Action, 14 acres of new disturbance would occur on private land as a result of pad, road, and pipeline construction. Following successful interim reclamation, the disturbance would be reduced to 6 acres. Removal of pinyon-juniper, sagebrush, and mixed shrub species would result in loss of existing and potential nesting sites for perching birds, potentially including BCC species. 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.

To minimize the potential for adverse impacts to nesting migratory birds, and especially BCC species, a COA would be applied to prohibit removal of vegetation and initiation of surface-disturbing activities ruction, drilling, or completion activities, or use of project-specific access roads to support during the period from May 1 to July 1. The BLM would grant an exception to this TL if a nesting survey during the breeding season for BCC species potentially present indicates no active nests within 30 meters (100 feet) of the pad, road, or other area proposed for surface disturbance (see Appendix A).

Because an inactive raptor nest (species unidentified) was found within 0.25 mile of the pad, Appendix A also includes a COA prohibiting the initiation of construction, drilling, or completion activities during a 60-day Timing Limitation (TL) period from April 1 to June 1 unless a survey during the breeding season in which activities are proposed documents that the nest is inactive. The MBTA prohibits a "take," which includes harassing, injuring, or killing a covered species and actions that result in mortality of eggs or nestlings.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts would be less than under the Proposed Action but would continue to include potential disturbance from human activity, vehicular traffic, and operation of heavy equipment.

Wildlife – Other Terrestrial Species

Affected Environment

MAMMALS

The site is located within winter range for mule deer (*Odocoileus hemionus*) as well as winter range and winter concentration areas for American elk (*Cervus elaphus*) as mapped by CPW (2011). Winter range is that part of the overall range of a species where 90% of the individuals are located during the average five winters out of ten from the first heavy snowfall to spring green-up, or during a site-specific period of winter as defined for each data analysis unit (DAU) (CPW 2011). Winter Concentration areas are that part of the winter range where densities are at least 200% greater than the surrounding winter range density during the same period used to define winter range in the average five winters out of ten (CPW 2011). Field surveys indicate that the project area is winter range for elk and year-round habitat for mule deer.

Large carnivores present in the project vicinity include the mountain lion (*Puma concolor*) and black bear (*Ursus americanus*). Mountain lions move seasonally to follow migrations of their preferred prey, mule deer. Two medium-sized 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 the project area include the ringtail (*Bassariscus astutus*) and western spotted skunk (*Spilogale gracilis*).

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

BIRDS

In addition to the species mentioned above in the section on Migratory Birds are a variety of residents or short-distance migrants such as the northern flicker (*Colaptes auratus*), common raven (*Corvus corax*), black-billed magpie (*Pica hudsonia*), western scrub-jay (*Aphelocoma californica*), and house finch (*Haemorhous mexicanus*).

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 in an area mapped by the CPW as wild turkey overall range and approximately 1 mile from an area mapped as a turkey production area. See the sections on Migratory Birds and Special-Status Species for discussions of other birds in the area.

REPTILES AND AMPHIBIANS

Species most likely to occur include the western fence lizard (*Sceloporus undulatus*) and gopher snake (bullsnake) (*Pituophis catenifer*) in xeric shrublands or grassy clearings and the western terrestrial garter snake (*Thamnophis elegans*) along creeks. Other reptiles potentially present along creeks, although more commonly found at lower elevations than the site, are the milk snake (*Lampropeltis triangulum*) and smooth green snake (*Opheodrys vernalis*).

Although the project area does not contain any suitable habitat, the surrounding area provides potentially suitable habitat for the northern leopard frog (see the section on Special Status Species) and two additional amphibians, the Woodhouse's toad (*Anaxyrus woodhousii*), and western chorus frog (*Pseudacris triseriata*). Within the CRVFO and vicinity, the spadefoot toad and Woodhouse's toad occur primarily along ephemeral washes that do not support fish and contain pools of water for a period of at least a few weeks every spring. The chorus frog occurs primarily in cattail and bulrush wetlands and along the vegetated margins of seasonal or perennial ponds and slow-flowing streams.

Environmental Consequences

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 14 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.

The greatest impact on wildlife, especially big game and raptors, would be the disturbance caused by increased human activity, equipment operation, vehicle traffic, harassment by any dogs brought to the site by contractors, and noise related to drilling and completion activities. Most species of wildlife are relatively secretive and distance themselves from these types of disturbance or move to different areas screened by vegetation screening or topographic features. This avoidance, referred to as displacement, results in underuse of habitat near the disturbance. Avoidance of forage and cover resources adjacent to disturbance reduces habitat utility and the capacity of the affected acreage to support wildlife populations.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, daily operations would still continue on the existing J6SE pad. Therefore, impacts to terrestrial wildlife would be less the Proposed Action but not eliminated.

SUMMARY OF CUMULATIVE IMPACTS

Historically, habitat loss or modification in the CRVFO areas was characteristic of agricultural, ranching lands, rural residential, with localized industrial impacts associated with the railroad and I-70 corridors and the small communities. More recently, the growth of residential and commercial uses, utility corridors, oil and gas developments, and other rural industrial uses (e.g., gravel mining along the

Colorado River) has accelerated the accumulation of impacts in the area. Cumulative impacts have included (1) direct habitat loss, habitat fragmentation, and decreased habitat effectiveness; (2) increased potential for runoff, erosion, and sedimentation; (3) expansion of noxious weeds and other invasive species; (4) increased fugitive dust from construction of oil and gas pads, roads, and pipelines and associated truck travel; (5) increased noise, especially along access and haul roads; (6) increased potential for spills and other releases of chemical pollutants; and (7) decreased scenic quality.

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

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

Based on the above, the Proposed Action would contribute to the collective adverse impact for some resources. Although the contribution would be minor, the Proposed Action would contribute incrementally to the collective impact to air quality, native vegetation, migratory birds, terrestrial wildlife, and other resources.

PERSONS AND AGENCIES CONSULTED

Heather Mitchell, Encana Oil and Gas Inc.

INTERDISCIPLINARY REVIEW

BLM staff who participated in the preparation of this EA are listed in Table 14.

Table 14. BLM Interdisciplinary Team Authors and Reviewers		
<i>Name</i>	<i>Title</i>	<i>Areas of Participation</i>
Christine Cimiluca	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid.
D. J. Beaupeurt	Realty Specialist	Lands and Realty
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Peter Cowan	Petroleum Engineer	Downhole COAs
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	NEPA Review, General Technical Review

Table 14. BLM Interdisciplinary Team Authors and Reviewers

<i>Name</i>	<i>Title</i>	<i>Areas of Participation</i>
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Julie McGrew	Natural Resource Specialist	Visual Resources
Judy Perkins, Ph.D.	Botanist	Invasive Non-native Species, Special-status Species (Plants), Vegetation
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special-status Species (Animals), Wildlife, Aquatic and Terrestrial
Todd Sieber	Geologist	Geology and Minerals, Groundwater

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APPENDIX A

Surface-Use and Downhole Conditions of Approval

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SURFACE-USE CONDITIONS OF APPROVAL

GENERAL STIPULATIONS/COAS APPLICABLE TO ALL ACTIVITIES FOR EA #DOI-BLM-CO-N040-2013-0042

The following standard surface-use Stipulations/COAs are in addition to all stipulations attached to the respective Federal leases and to any site-specific COAs for individual well pads. In cases of discrepancies, the following COAs supersede earlier versions.

COMMON CARRIER: Common carrier provisions shall be applied, per **43CFR2885.11(b)** construct, operate, and maintain the pipeline as a common carrier. This means that the pipeline owners and operators must accept, convey, transport, or purchase without discrimination all oil or gas delivered to the pipeline without regard to where the oil and gas was produced (*i.e.*, whether on Federal or non-Federal lands).

1. Administrative Notification. The operator shall notify the BLM Authorized Officer (AO) at least 48 hours prior to initiation of construction. If requested by the AO, 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. Copies of the Right-of-way (ROW) grant/TUP with the stipulations shall be kept on site during construction and maintenance activities. All construction personnel shall review the grant and stipulations before working on the ROW/TUP
3. Road Construction and Maintenance. Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. (Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development, The Gold Book, Fourth Edition—Revised 2007, BLM/WO/ST-06/021+3071/REV 07.) The exterior boundaries of the authorized right-of-way shall be clearly marked/flagged before any surface disturbing activities shall occur. 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.

4. Pipeline Construction. The pipeline shall be installed to industry and BLM “Gold Book” standards. (Surface Operating Standards and Guidelines for Oil and Gas Exploration and Development: The Gold Book. Fourth Edition—Revised 2007; (P-417 BLM/WO/ST-06/021+3071/REV 07.)

The pipeline(s) shall be buried with at least 4 feet of cover and within the 30-foot permanent ROW corridor. Overall construction width shall not exceed 55-feet including the temporary use area(s) noted on the plans and included in the grant. The centerline of the ROW and the exterior limits shall be clearly flagged prior to any construction activity.

5. 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.

6. Transportation/ Road Maintenance: Commuting construction crews shall car pool to reduce the number of vehicle trips on local area roads and associated wear and tear. Operator/Right-of-way Holder shall ensure the commuting construction crews comply with posted speed limits on public roads and limit driving speeds to 20 mph on more primitive access roads to reduce the potential for vehicle collisions as well as to reduce traffic related noise and pollution.
7. Saturated Soils Conditions. When saturated soil conditions exist on or along the proposed ROW, construction shall be halted until soil material dries out or is frozen sufficiently for construction to proceed without undue damage and erosion to soils.
8. Survey Monuments. The holder shall protect all survey monuments found within the right-of-way. Survey monuments include, but are not limited to, General Land Office and Bureau of Land Management Cadastral Survey Corners, reference corners, witness points, U.S. Coastal and Geodetic benchmarks and triangulation stations, military control monuments, and recognizable civil (both public and private) survey monuments. In the event of obliteration or disturbance of any of the above, the holder shall immediately report the incident, in writing, to the authorized officer and the respective installing authority, if known. Where General Land Office or Bureau of Land Management right-of-way monuments or references are obliterated during operations, the holder shall secure the services of a registered land surveyor or a Bureau Cadastral Surveyor to restore the disturbed Monument(s) and References using survey procedures found in the Manual of Surveying Instruction of the Survey of the Public Lands in the United States, latest edition. The holder shall record survey into the appropriate county and send a copy to the authorized officer. If the Bureau Cadastral Surveyors or other Federal surveys are used to restore the disturbed survey monument, the holder shall be responsible for the survey cost. Reference 43 CFR 9185.4-1(a).
9. Private Landowners and Existing Rights-of-Way. The operator shall obtain agreements allowing construction with all existing authorized surface users of Federal pad locations prior to surface disturbance or construction of the location, staging areas, or access across or adjacent to any existing well pad locations. In the case of privately owned surface, the operator shall certify to BLM that a Surface Use Agreement has been reached with the authorized surface user, prior to commencing construction.
10. Hold Harmless Clause. The operator agrees to indemnify the United States against any liability arising from the release of any hazardous substance or hazardous waste (as these terms are defined in the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601 et seq. or the Resource Conservation and Recovery Act, 42 U.S.C. 6901, et seq.) on the ROW (unless the release or threatened release is wholly unrelated to the operator's activity in the ROW). This agreement applies without regard to whether a release is caused by the operator, its agent, or unrelated third parties.
11. Compliance with Laws. The operator shall comply with all applicable Federal laws and regulations existing or hereafter enacted or promulgated. In any event, the operator shall comply with the Toxic Substances Control Act of 1976, as amended (15 U.S.C. 2601 et seq.) with regard to any toxic substances that are used, generated by, or stored on the ROW or on facilities authorized under this ROW grant (see 40 CFR, Part 702-799 and especially, provisions on polychlorinated biphenyls, 40 CFR 761.1-761.193). Additionally, any release of toxic substances (leaks, spills, etc.) in excess of the reportable quantity established by 40 CFR, Part 117 shall be reported as required by the Comprehensive Environmental Response, Compensation and Liability Act of 1980, Section 102b. A copy of any report required or requested by any Federal agency or state government as a result of a

reportable release of spill of any toxic substances shall be furnished to the Authorized Officer concurrent with the filing of the reports to the involved Federal agency or state government.

12. Utilities Locations. All existing pipelines, surface valves, and other utilities shall be field located, clearly marked, and the appropriate Utility Notification Center (www.unc.org) shall be notified before any construction/surface work occurs. All publicly owned underground facilities shall be marked according to the APWA color code.
13. Compliance with Stipulations. This grant is issued subject to the holder's compliance with all applicable regulations contained in Title 43 Code of Federal Regulations part 2880.
14. Pipeline Warning Signs. Pipeline warning signs shall be installed within five days of construction completion and prior to use of the pipeline for transportation of product. Pipeline warning signs are required at all road crossings. Signs shall be visible from sign to sign along the R/W. For safety purposes each sign shall be permanently marked with the holder's name and shall clearly identify the owner (emergency contact) and purpose (product) of the pipeline. (49 CFR 192.707 Line Markers for Mains and Transmission Lines.)
 - (a) Buried pipelines. Except as provided in paragraph (b) of this section, a line marker must be placed and maintained as close as practical over each buried main and transmission line:
 - (1) At each crossing of a public road and railroad; and
 - (2) Wherever necessary to identify the location of the transmission line or main to reduce the possibility of damage or interference.
 - (b) Pipelines aboveground. Line markers must be placed and maintained along each section of a main and transmission line that is located aboveground in an area accessible to the public.
 - (c) Marker warning. The following must be written legibly on a background of sharply contrasting color on each line marker:
 - (1) The word "Warning," "Caution," or "Danger" followed by the words "Gas (or name of gas transported) Pipeline" all of which, except for markers in heavily developed urban areas, must be in letters at least 1 inch (25 millimeters) high with 1/4 inch (6.4 millimeters) stroke.
 - (2) The name of the operator and the telephone number (including area code) where the operator can be reached at all times.

[Amdt. 192-20, 40 FR 13505, Mar. 27, 1975; Amdt. 192-27, 41 FR 39752, Sept. 16, 1976, as amended by Amdt. 192-20A, 41 FR 56808, Dec. 30, 1976; Amdt. 192-44, 48 FR 25208, June 6, 1983; Amdt. 192-73, 60 FR 14.0650, Mar. 20, 1995; Amdt. 192-85, 63 FR 37504, July 13, 1998]

15. Open Trenches. All open trenches shall be maintained in a safe condition to ensure no side-wall collapsing occurs and that all personnel, livestock, and wildlife are safe from falling into an open trench or being trapped or injured within the trenches. (*Reference: OSHA 29 CFR 1926.650*)

Protective systems may include, but not be limited to:

- Install supports to prevent movement of the trench walls. Trenches shall not exceed 20 feet in depth.

- Provide shielding to protect workers by using trench boxes or other types of supports to prevent soil cave-ins.
- Provide a way to exit a trench – such as a ladder or ramp – requiring no more than 25 feet of lateral travel for personnel, livestock, or wildlife in the trench.
- Keep spoils at least two feet back from the edge of a trench.
- Ensure that trenches are inspected by competent personnel prior to entry and after any event such as a rainstorm that increases the hazard.

Trenches adjacent to access roads and/or public or private dwellings shall be covered and/or warning barriers erected upon completion of daily construction or at any time personnel are not present on the construction site.

16. Reporting of Undesirable Events. Operator/ROW Holder agrees to comply with, and be bound by, the terms and conditions of 43 CFR 2880 Mineral Leasing Act, Part 2885.11, concerning the reporting of undesirable events. (Reference: NTL-3A, issued pursuant to the authority prescribed in Title 30 CFR 221.5, 221.7, and 221.36.) *Any incidents on BLM managed public lands shall be reported to the AO of that field office as soon as possible.*

17. Pipeline Testing. The entire pipeline shall be tested in compliance with DOT regulations (49 CFR Part 192). Incremental segments of the pipeline shall be filled to the desired maximum pressure and held for the duration of the test (8 hours minimum). (Ref. 49 CFR 192.503.c).

Notification to all nearby residents as well as the appropriate county dispatch center shall be made no less than 24 hours prior to the pressure test and blow down. All necessary and reasonable precautions shall be taken to ensure the safety of the employees and the general public, the lands, domestic animals and wildlife, etc. This may include, but not be limited to, restriction of access to the pipe being tested, temporary warning signs installed in appropriate locations, effective communication.

Operator/ROW Holder shall ensure that pressure-testing operations are carried out in accordance with the following:

- United States Department of Transportation Code of Federal Regulations (CFR), Title 49, Part 192, Subpart J, entitled “Test Requirements”
- Environmental Protection Agency
- Portable compressors for pressure testing shall not be stationed within 100 feet of any residence. All nearby residents as well as the appropriate County Dispatch Center shall be notified at least 24 hours in advance of beginning the pipeline loading process.

18. Welding of Pipeline. A minimum of 10% of all welds shall be x-rayed. Visual inspections shall be performed on 100% of all pipeline welds. Any pipeline occurring within the Rifle Municipal Watershed Area and/or within 100 feet of any perennial or intermittent stream crossing shall have all welds x-rayed. All bored areas shall have 100% x-rays of all pipeline welds. (Ref. 49 CFR 192.225 Welding procedures) All welders shall be appropriately certified. (Ref. 49 CFR 192.227 Qualification of welders). (NOTE: 49 CFR Subpart F—Joining of Materials Other than by Welding (192.281 includes plastic pipe).)

19. Fire Suppression. Welding or other use of acetylene or other torch with open flame shall be operated in an area barren or cleared of all flammable materials at least 10 feet on all sides of equipment. Internal combustion engines shall be equipped with approved spark arrestors which meet either (a)

the USDA Forest Service Standard 5100-1a or (b) Society of Automotive Engineers (SAE) recommended practices J335(b) and J350(a).

20. Generator Noise. The generator(s) and pump(s) serving the injection well shall be installed and operated at the site in a manner that, at a minimum, meets the Colorado Oil and Gas Conservation Commission's Noise Abatement regulation (No. 802) for Residential/Agricultural/Rural Zone. In summary, this regulation requires that the noise level not exceed 50 db(A) between 7:00 p.m. and 7:00 a.m. at a distance of 350 feet from the noise source.
21. 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. 15 or mark.a.gilfillan@usace.army.mil.

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.

22. 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 jurisdictional waters may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17 or mark.a.gilfillan@usace.army.mil. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.
23. 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.
24. 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 plats, 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.
- d. Seedbed Preparation. For cut-and-fill slopes, initial seedbed preparation shall consist of backfilling and recontouring to achieve the configuration specified in the reclamation plan. For compacted areas, initial seedbed preparation shall include ripping to a minimum depth of 18 inches, with a maximum furrow spacing of 2 feet. Where practicable, ripping shall be conducted in two passes at perpendicular directions. Following final contouring, the backfilled or ripped surfaces shall be covered evenly with topsoil.

Final seedbed preparation shall consist of scarifying (raking or harrowing) the spread topsoil prior to seeding. If more than one season has elapsed between final seedbed preparation and seeding,

and if the area is to be broadcast-seeded or hydroseeded, this step shall be repeated no more than 1 day prior to seeding to break up any crust that has formed.

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

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

- 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 14.0 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.
25. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive Weed Management Plan for Oil and Gas Operators*, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports and Pesticide Application Records (PARs), including GPS records for weed treatment locations, shall be submitted to the BLM by **December 1**.
26. Big Game Winter Range Timing Limitation. To minimize impacts to wintering big game, no construction, drilling or completion activities shall occur during a Timing Limitation (TL) period from **January 16 to April 29 annually**.
27. 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).
28. Raptor Nesting. Raptor nest surveys in the project vicinity resulted in the location of one or more raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other

surface facility. To protect nesting raptors, a 60-day Timing Limitation (TL) shall be applied to construction, drilling, or completion activities within the buffer widths specified above, if the activities would be initiated during the nesting period of April 1 to June 1. An exception to this TL may be granted for any year in which a subsequent survey determines one of the following: (a) the nest is in a severely dilapidated condition or has been destroyed due to natural causes, (b) the nest is not occupied during the normal nesting period for that species, (c) the nest was occupied but subsequently failed due to natural causes, or (d) the nest was occupied, but the nestlings have fledged and dispersed from the nest. If project-related activities are initiated within the specified buffer distance of any active nest, even if outside the 60-day TL period, the operator remains responsible for compliance with the MBTA with respect to a “take” of birds or of active nests (those containing eggs or young), including nest failure caused by human activity (see COA for Migratory Birds).

29. Migratory Birds – Birds of Conservation Concern. Pursuant to BLM Instruction Memorandum 2008-050, all vegetation removal or surface disturbance in previously undisturbed lands providing potential nesting habitat for Birds of Conservation Concern (BCC) is prohibited from **May 1 to July 1**. An exception to this TL may be granted if nesting surveys conducted no more than one week prior to surface-disturbing activities indicate that no BCC species are nesting within 30 meters (100 feet) of the area to be disturbed. Nesting shall be deemed to be occurring if a territorial (singing) male is present within the distance specified above. Nesting surveys shall include an aural survey for diagnostic vocalizations in conjunction with a visual survey for adults and nests. Surveys shall be conducted by a qualified breeding bird surveyor between sunrise and 10:00 AM under favorable conditions for detecting and identifying a BCC species. This provision does not apply to ongoing construction, drilling, or completion activities that are initiated prior to May 1 and continue into the 60-day period at the same location.
30. Migratory Birds – General. It shall be the responsibility of the operator to comply with the Migratory Bird Treaty Act (MBTA) with respect to “take” of migratory bird species, which includes injury and direct mortality resulting from human actions not intended to have such result. To minimize the potential for the take of a migratory bird, the operator shall take reasonable steps to prevent use by birds of fluid-containing pits associated with oil or gas operations, including but not limited to reserve pits, produced-water pits, hydraulic fracturing flowback pits, evaporation pits, and cuttings trenches. Liquids in these pits—whether placed or accumulating from precipitation—may pose a risk to birds as a result of ingestion, absorption through the skin, or interference with buoyancy and temperature regulation.

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

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

31. 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.
32. Ips Beetle. To minimize the potential for triggering or expanding an outbreak of the *Ips* beetle, the BLM may require any pinyon trees inadvertently damaged or intentionally trimmed during road, pad, or pipeline construction to be cut to the ground or grubbed from the ground and either chipped and buried in the toe of the fill slope or removed within 24 hours to a location approved by the Colorado State Forest Service. Prior to authorizing use of any slash from pinyon pines for purposes of visual mitigation, erosion control, as a coarse mulch, or to impede travel along a pipeline route by off-highway vehicles, the BLM will inspect the affected stand for signs of *Ips* beetle infestation. No slash or pruned material from an infected stand shall be used for such purposes.
33. 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.

34. 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).

35. 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.

All woody vegetation (live and dead) shall remain standing along the southeast edge of the well pad fill slope to provide visual screening. All woody vegetation left standing at the toe of the fill slope shall be protected and remain standing and undamaged when fill material is pulled back to recontour the well pad.

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

A berm along the southern edge of the recontoured well pad, during interim reclaim, shall be utilized to interrupt the sightline from viewers to the south of the well pad. The berm will help break up the form and texture of the facilities; and the scale of the cut slope; and should appear to be a natural extension of the landscape.

During construction, interim reclamation, and production facility placement, the BLM and Encana representatives shall jointly review construction measures and location of production facilities to determine effectiveness in meeting visual resource mitigation measures, and if subtle changes in

construction techniques and production facility placement are warranted, they could be directed by the BLM Authorized Officer.

35. 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.
37. 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.
38. 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 J6SEB WELL PAD

The following site-specific surface use COAs are in addition to the standard COAs applicable to all wells within the J6SEB pad and all stipulations attached to the respective Federal leases.

1. Natural Gas Pipeline As-Built Survey. An “as-built” center line survey of the right-of-way crossing Federal land, provided by a Certified Land Surveyor licensed to work in the State of Colorado, shall be provided to the AO within 2 months of completion of the project.

BUREAU OF LAND MANAGEMENT

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

DOWNHOLE CONDITIONS OF APPROVAL Applications for Permit to Drill

Operator:	Encana Oil & Gas (USA) Inc.
Agreement Number:	CIC55972E (Lease COC51156)
Pad(s):	J6SEB
Surface Location:	Garfield County; NWSE, Sec. 6 T8S R92W
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; Alex Provstgaard, PET; Brandon Jamison, PET.
2. A CRVFO petroleum engineer shall be contacted for a verbal approval prior to commencing remedial work, plugging operations on newly drilled boreholes, changes within the drilling plan, sidetracks, changes or variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Contact Shauna Kocman or Peter Cowan for verbal approvals (contact information below).
3. If a well control issue or failed test (e.g. kick, blowout, water flow, casing failure, or a bradenhead pressure increase) arises during drilling or completions operations, Shauna Kocman or Peter Cowan shall be notified within 24 hours from the time of the event. IADC/Driller's Logs and Pason Logs (mud logs) shall be forwarded to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 24 hours of a well control event.
4. The BOPE shall be tested and conform to Onshore Order No. 2 for a 5M system and recorded in the IADC/Driller's log. A casing head rated to 5,000 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 CFR 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.
16. After drilling the surface casing for all wells, email Julie King, jjking@blm.gov, the casing tally and cementing report.

Contact Information

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List of Wells			
<i>Proposed Pads</i>	<i>Proposed Wells</i>	<i>Surface Locations</i>	<i>Bottomhole Locations</i>
J6SEB Pad (BLM Surface)	HMU 6-11A	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 5
	HMU 6-12D	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 5
	HMU 6-12DD	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 5
	HMU 6-13A	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 6
	HMU 6-13AA	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 6
	HMU 6-13D	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 Lot 6
	HMU 6-15A	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 SWSE
	HMU 6-15AA	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 SWSE
	HMU 6-15D	T8S R92W, Sect. 6 NWSE	T8S R92W, Sect. 6 SWSE

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FONSI

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

DECISION RECORD

DECISION: It is my decision to approve the Proposed Action as described and analyzed in this EA.

RATIONALE: The bases for this decision are as follows:

1. This decision will provide for the orderly, economical, and environmentally sound exploration and development of oil and gas resources on Federal oil and gas leases.
2. Approval of the Proposed Action validates the rights granted with the Federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.
3. Environmental impacts will be avoided or minimized through protective lease stipulations and by the best management practices and mitigation measures included in the Proposed Action or otherwise applied and enforced by BLM as Conditions of Approval (COAs).
4. This decision does not authorize the initiation of surface-disturbing activities on BLM lands or the development of new Federal oil and gas wells on new or existing well pads. Surface-disturbing activities on BLM lands and development of Federal wells will not commence until approval by BLM of Applications for Permits to Drill (APDs) or issuance by BLM of right-of-way grants pursuant to this EA.

MITIGATION MEASURES: Mitigation measures presented in Appendix A of the EA will be incorporated as COAs for both surface and drilling operations and attached to APDs for the Federal wells drilled on the proposed well pads.

NAME OF PREPARER: Christine Cimiluca, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:



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

DATE: April 22, 2013