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-N040-2013-0028-EA

CASEFILE NUMBER

Bottomhole for Federal well is located within Federal Lease COC56035.

PROJECT NAME

Proposal to Drill One Federal Well from the Existing J24NW Well Pad on Private Land in Mamm Creek, Garfield County, Colorado.

PAD LOCATIONS

Township 6 South (T6S), Range 93 West (R93W), Section 24, NW/SE, 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 one Federal gas well from one existing pad, the J24NW, located in the Mamm Creek Field, Garfield County, Colorado (Figure 1). The J24NW pad is located on split-estate land (private surface underlain by Federal minerals). The Federal well would be drilled into underlying Federal lease COC56035 (Figure 2). Figure 3 shows the proposed construction layout of the J24NW pad. Encana plans to construct the pad in April 2013 and begin drilling the wells in May 2013. The project would result in 8.52 acres of initial surface disturbance (expansion of the existing well pad) and 1.75 acres of long-term disturbance through the production phase (Table 1). Figure 4 shows the proposed interim reclamation and long term disturbance during the production phase of the wells on the J24NW pad.

Table 1. New Surface Disturbance

Component	*Initial Disturbance*	*Long-term Disturbance*
Well Pad	8.52 acres	1.75 acres
Access Road	0	0
Pipeline	0	0
Total	**8.52 acres**	**1.75 acres**

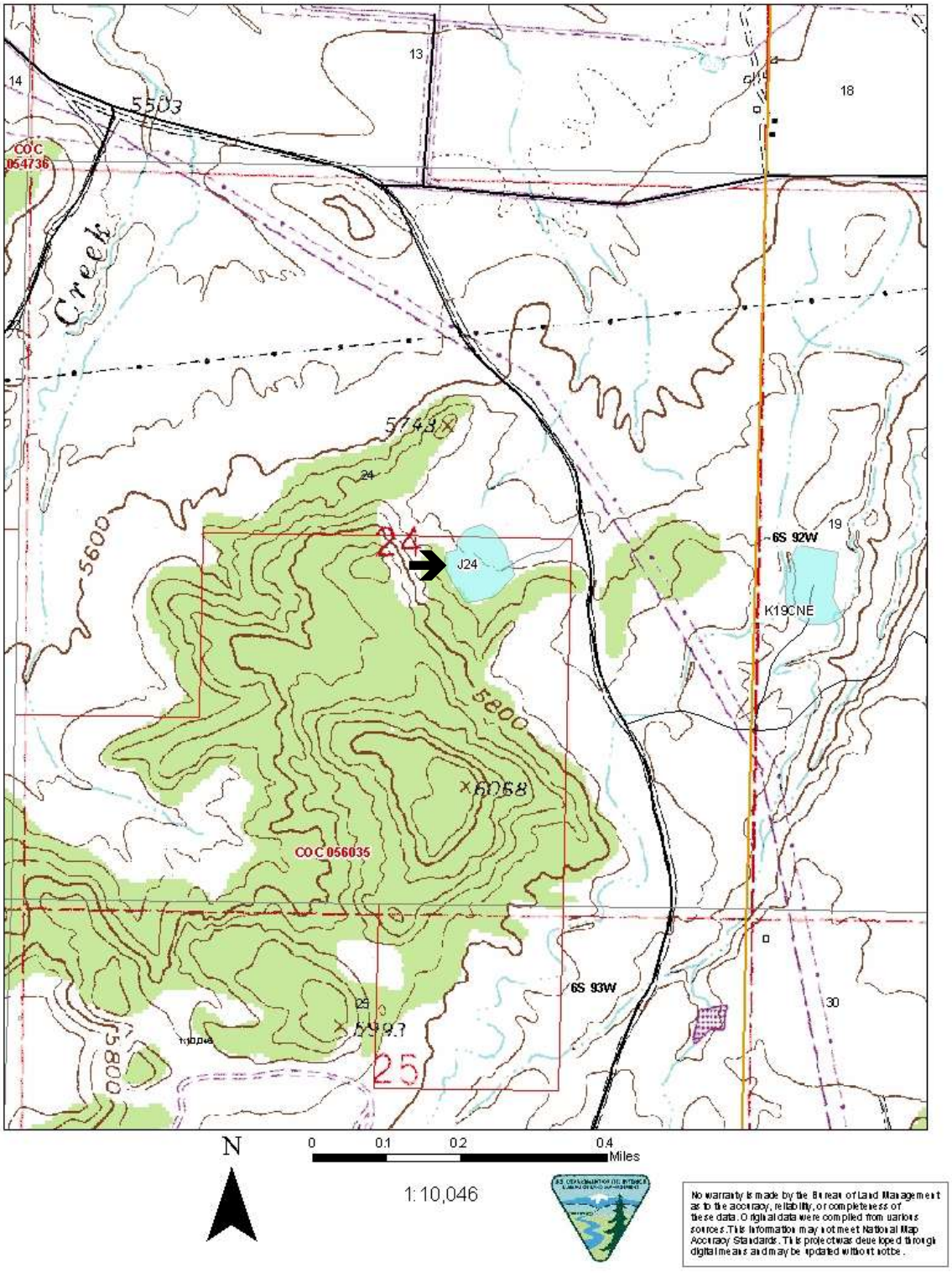

Figure 1. Location Map showing Existing Pad Access to J24NW Pad (Arrow).

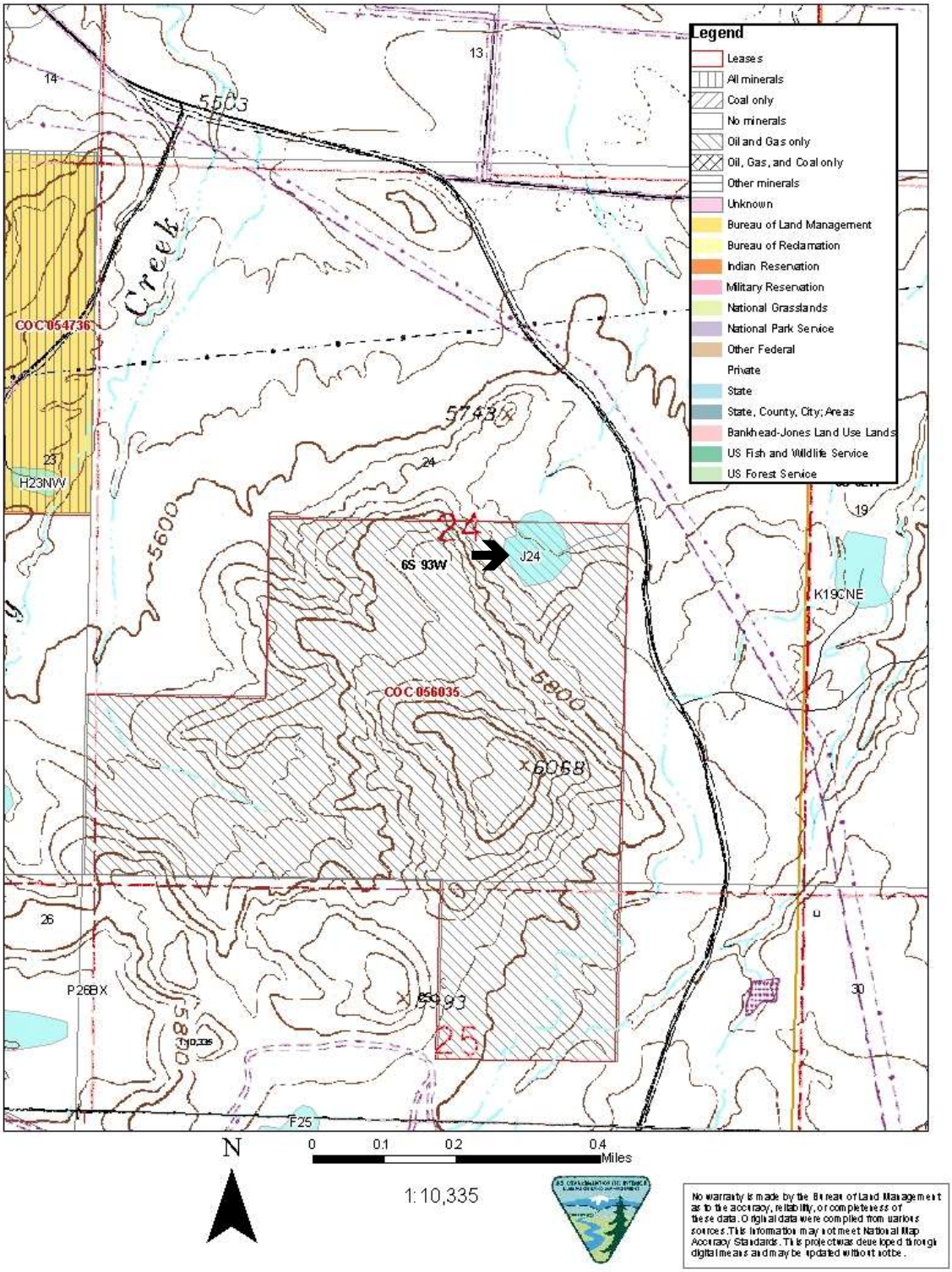

Figure 2. Surface and Mineral ownership in the J24NW Project Area.

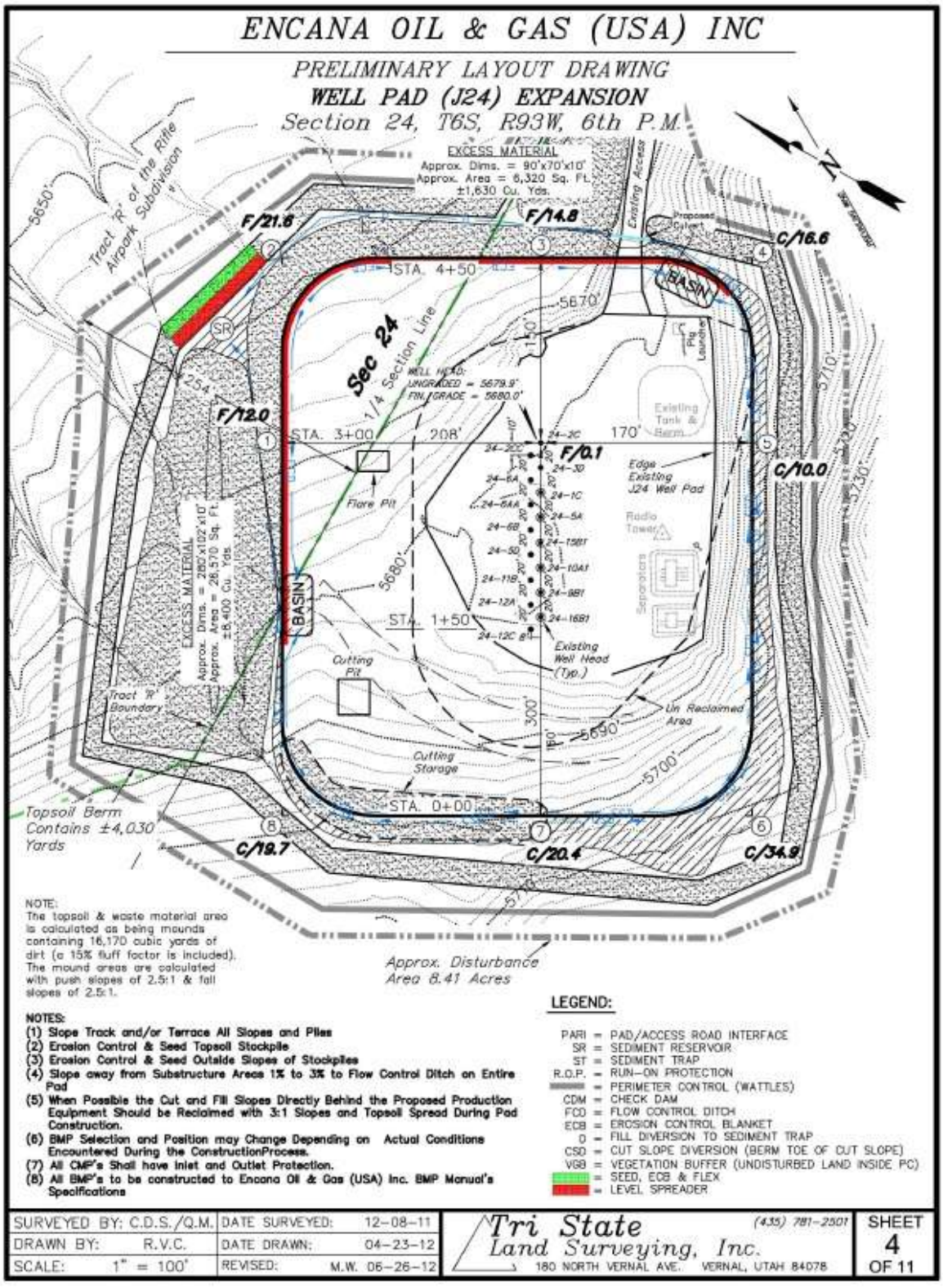

Figure 3. J24NW Pad Construction Layout

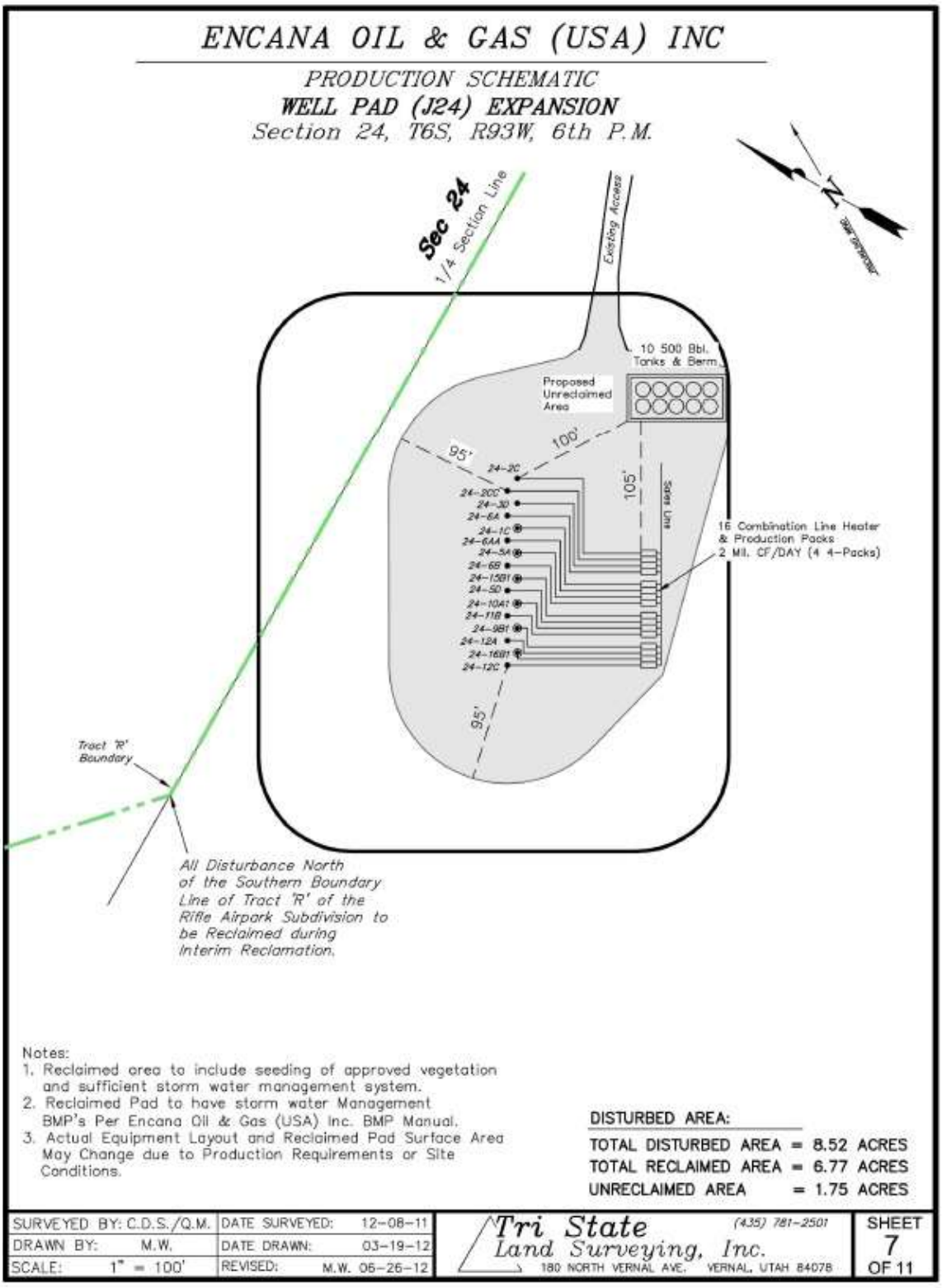

Figure 4. J24NW Interim Reclamation Plat

Names and locations of the well(s) are presented in Table 2. The J24NW pad was included by Encana as an existing well pad in the Environmental Assessment (EA) for the *Grass Mesa Geographic Area Plan (GMGAP)*, approved on November 4, 2004 (CO-140-2004-081-EA). However, no new wells were proposed on this pad in the GMGAP.

Table 2. Surface and Bottomhole Locations of Proposed Federal Wells

Proposed Pad	*Proposed Wells*	*Surface Locations*	*Bottomhole Locations*
J24NW	Alp Federal 24-11B	T6S R93W, Section 24 NWSE, 2446 feet FSL 1936 feet FEL	T6S R93W, Section 24 NWSE, 2378 feet FSL 1614 feet FWL

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 12 feet by 10 feet) and a cuttings pile. Cuttings deposited in the cuttings bin would be solidified with sawdust. Cuttings would be moved from the steel bin to the cuttings pile. Once drilling is finished the cuttings would be buried on the location and reclaimed. Existing access roads and pipelines would serve the proposed wells. No new access roads or pipelines are proposed.

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. Encana would install two temporary 8-inch waterlines 30 days before operations are planned and would remove the waterlines 60 days after completions are finished. The temporary surface waterlines would cross Fee lands, and would be approximately 1,793 feet in length. The temporary water lines would run from the J24NW pad to an existing surface pipeline used for the existing K19CNE pad.

The road, pipeline, and pad construction work would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). A 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 one Federal well from Fee surface into the subsurface minerals encumbered with Federal oil and gas lease COC56035. 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.

PURPOSE AND NEED FOR THE ACTION

The purpose of the action is to develop oil and gas resources on Federal lease COC56035 consistent with existing Federal lease rights. The action is needed to increase the development of oil and gas resources for commercial marketing to the public.

SUMMARY OF LEASE STIPULATIONS

Federal lease COC56035 has a big game winter range Timing Limitation (TL) stipulation, which prohibits construction, drilling, and completion activities during the period December 1 through April 30. Site-specific Conditions of Approval (COAs) developed during the Environmental Assessment (EA) review and onsite field consultation would also be applied to the J24NW well pad and attached to the approved Application for Permit to Drill (APDs) for proposed Alp Federal 24-11B well (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 is open to oil and gas leasing and development. The 1999 RMP amendment requires multi-year development plans for lease development over a large geographic area. However, the 1999 RMP amendment also provides exceptions to that requirement for individual or small groups of exploratory wells drilled in relatively undrilled areas outside known high production areas. The Proposed Action is therefore in conformance with the exception to the requirement to require operators to submit MDPs, previously known as GAPs.

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

Access and Transportation

Affected Environment

The project area would be located approximately 2.4 miles southeast of Rifle, Garfield County, Colorado. The primary vehicle access is as follows: From Interstate 70 (I-70) at Exit 94, proceed south on Garfield County Airport Road and travel southerly and then westerly approximately 1.8 miles to an intersection with Hunter Mesa Road (County Road 333) on the left. Proceed southeasterly on Hunter Mesa Road approximately 0.5 mile to an intersection with the existing access road to the existing J24NW well pad on the right. Turn right and follow the access road westerly approximately 0.1 mile to the existing Encana J24NW well pad.

The existing access road would be utilized in expansion of the J24NW pad and the drilling and completion of the new Federal well. 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. Degradation of field development roads may occur due to heavy equipment travel and fugitive dust and noise would be created. Mitigation measures (Appendix A) would be required as COAs to ensure that adequate dust abatement and road maintenance occur.

Table 3. Traffic Associated with Drilling and Completion Activities		
Vehicle Class	***Trips per Well***	***Percent of Total***
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 J24NW pad. In addition, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on access and transportation would be less than under the Proposed Action but not eliminated.

Air Quality

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 (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter less than 10 microns (µ) in diameter (PM_{10}), 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 J24 NW pad and constructing, drilling, completing, and operating 1 new Federal. In addition, the pad would total disturbance from construction of a new pad would be 8.52 acres which would be reduced to 1.75 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 access roads, pads, and pipelines and drilling and completing the wells.

Pollutants generated during construction activities would include combustion emissions and fugitive dust associated (PM_{10} 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, NO_2, SO_2, ozone, PM_{10}, 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 WPX'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 well would not be approved. However, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. 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 in to account the effects their actions will have on cultural resources. As a general policy, an agency must consider effects to cultural resources for any undertaking that involves Federal monies, Federal permitting/authorization, or Federal lands.

Three Class III cultural resource inventories (CRVFO# 5402-2, 5404-19 and 5413-2) have been conducted either specifically for this pad and access, or a proposed pad and access in the immediate vicinity. The most recent of these inventories was conducted by Metcalf Archaeological Consultants, Inc. for WPX Energy in November of 2012. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records identified six cultural resources in the project vicinity. Three of the cultural resources are prehistoric isolated finds and by definition not eligible to the National Register of Historic Places (NRHP), two of the sites are a non-eligible historic trash scatter and the historic ruins of a non-eligible wooden structure, and the remaining site (5GF3569) has been evaluated as a "need data" site and potentially eligible for the 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 potentially eligible site (5GF3569) in the project vicinity is located on a mesa above and over 240 meters from the project area, no historic properties are anticipated to be affected by the construction of the proposed natural gas pad expansion. 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 known or 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 will be attached to the EA. The importance of this COA should 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, EnCana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, the No Action Alternative would most likely reduce although not eliminate the potential for accidental damage, vandalism, illegal collection and excavation on the public lands involved.

Fossils Resources

Affected Environment

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

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

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, crocodilians, 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. Because the project site is private surface, BLM's regulatory authority does not support application of the CRVFO's standard COA for the protection of paleontological resources. However, are encountered, a standard paleontological COA would not be attached to the APDs, however BMPs in relation to paleontological resources would be strongly encouraged as per the COA (Appendix A).

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. Therefore, impacts on fossil resources would be less than under the Proposed Action but not eliminated.

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).

Bedrock exposed in the project area is the Tertiary Wasatch Formation (Table 4). 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 project area, Wasatch Formation is mantled by unconsolidated sedimentary surface deposits of Quaternary age in the form of sheetwash deposits. The thickness of these unconsolidated sediments is uncertain, but the depth to the underlying Wasatch Formation may be determined during construction excavation.

Table 4. Geologic Formations within the Study Area					
Map Symbol	***Lithologic Pattern***	***Formation Name***	***Age***	***Characteristics***	***Location***
Qsw		Sheetwash Deposits	Holocene	Poorly sorted clay, silt, sand and gravels.	Slopes and depressions.
Tw		Wasatch Formation	Eocene/ Paleocene	Variegated purple, lavender, red gray and brown claystone.	Steep slopes and outcrops.
Source: Shroba et al. (1994)					

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

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

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

Environmental Consequences

Proposed Action

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

Natural gas production from the proposed wells would contribute to the draining of hydrocarbon-bearing reservoirs within the Mesaverde Group in this area, an action that would be consistent with BLM

objectives for mineral production. Hydraulic fracturing would be utilized to create fractures within the formation to allow gas production from the wells. In recent years, public concern has been voiced regard potential impacts of hydraulic fracturing from "micro-earthquakes" and from contamination of freshwater aquifers. Use of hydraulic fracturing is addressed in the section on Water Quality - Ground.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on geology and minerals would be less than under the Proposed Action but not eliminated.

Invasive Non-Native Plants

Affected Environment

The project area is located at approximately 5,700 feet elevation within a low-gradient toe-slope shallowly incised by multiple gullies at the foot of steeper hillsides and low sandstone bluffs. Sagebrush and grasses dominate the vegetation below the project site, while pinyon-juniper woodland dominates the hillside vegetation above this site. Much of the vegetation surrounding the existing well pad disturbance area shows evidence of past grazing disturbance, and the annual non-native grass called cheatgrass or downy brome (*Bromus tectorum*), a State List C noxious weed, is widespread and interspersed throughout the sagebrush. Additionally, several non-native undesirable plant species are present, particularly near roads and around the periphery of the existing pad. These include Russian-thistle (*Salsola tragus*), kochia (*Bassia scoparia*), and yellow sweetclover (*Melilotus officinalis*).

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 8.52 acres would be disturbed. Following construction completion, 6.95 acres would undergo temporary reclamation seeding. A total of 1.75 acres would remain as long-term disturbance areas. All of this disturbed acreage would occur 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 (Zwaenepoel et. al. 2006, Schmidt 1989). 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, Vogelsgang 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. Cheatgrass is also widespread surrounding the pad site. 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, because the land surface is under private ownership, 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, the potential for new or expanded weed infestations would be similar and potentially greater because BLM requirements for weed control would not apply to the project.

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). 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.

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.

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*).

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. An inactive raptor nest (probably a Cooper's hawk was identified near the outer edge of a 0.25-mile perimeter during surveys in June 2012.

Environmental Consequences

Proposed Action

Under the Proposed Action, 8.52 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 1.75 acres. Removal of pinyon-juniper, sagebrush, and mixed shrub species would result in loss of existing and potential nesting sites for perching birds. While habitat loss and fragmentation may affect individual birds, it is not expected to adversely impact a species as a whole. If construction, drilling, or completion activities occur during the nesting season, visual and noise disturbance near active nests could cause nest abandonment and failure, reducing the productivity of affected species. Construction activity during the nesting season could also result in the destruction of clutches and/or mortality of nestlings.

Because an inactive nest was found within 0.25 mile of the pad, Appendix A includes a COA precluding the initiation of construction, drilling, or completion activities during a 60-day Timing Limitation (TL) period from May 1 to July 1 unless a survey during the breeding season in which activities are proposed documents that the nest is also inactive in that year. The MBTA prohibits "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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on migratory birds, would be similar to those under the Proposed Action,

although drilling and completing fewer wells would shorten the period of disturbance. Under the No Action Alternative, Encana would remain subject to the provisions of the MBTA and the BGEPA regarding raptor nests in the project vicinity.

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 vicinity of the project area 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. The operator is required to 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, EnCana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface

location. Therefore, the No Action Alternative would most likely reduce although 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 2.4 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

Zone	*7:00 A.M. to 7:00 P.M*	*7:00 P.M. to 7:00 A.M*
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 ¼ 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-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			
Equipment	***Noise Level (dBA)***		
	50 feet	***500 feet***	***1,000 feet***
Air Compressor, Concrete Pump	82	62	56
Backhoe	85	65	59
Bulldozer	89	69	63
Crane	88	68	62
Front End Loader	83	63	57
Heavy Truck	88	68	62
Motor Grader	85	65	59
Road Scraper	87	67	61
Tractor, Vibrator/Roller	80	60	54
Sources: BLM (1999a), La Plata County (2002)			

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

Noise impacts would decrease during the production phase but would remain background noise levels. During maintenance and well workover operations, noise levels would temporarily increase above those associated with routine well production. These increased noise levels would be in addition to levels of noise that are already above background levels due to current oil and gas developments in the area. As stated above, the nearest residence about 0.25 mile away. While exposure to these noise levels is unlikely to be harmful, it may be annoying to residents.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on noise would be only slightly less overall than the Proposed Action.

Socioeconomics

Affected Environment

The project area is located within Garfield County, Colorado. The population of Garfield County grew by 28.8% from 2000 to 2010, representing an increase from 43,791 to 56,389 residents (DOLA 2010). Population growth in Garfield County is expected to more than double over a 20-year period from approximately 50,000 in 2005 to approximately 106,500 in 2025 (DOLA 2010).

In 2009, industry groups in Garfield County with the highest percentage of total employment were construction 15%, tourism 12%, retail trade 13%, and education and health 20% (Colorado Department of Labor and Employment 2010). An estimated 13% of the population was retired in 2000 and did not earn

wages (Garfield County 2000). Employment in agriculture, forestry, hunting, and mining accounted for 8% of total employment (Colorado Department of Labor and Employment 2010).

Personal income in Garfield County has also risen, from $504 million in 1990 to $2.2 billion in 2008 (USDOC 2011). Annual per capita income has grown in the same period; from about $19,354 to $40,166 (USDOC 2011), and the average earnings per job in 2005 was approximately $37,500 (Garfield County 2007). The communities of Parachute, Silt, and Rifle are the most affordable for housing, while the communities of Battlement Mesa, New Castle, and Glenwood Springs are the least affordable, with the cost to rent or own similar housing higher by 50% or more (BLM 2006).

Activities on public land in the vicinity of the project area are primarily ranching/farming, hunting, OHV travel, and the development of oil and gas resources. Hunters contribute to the economy because many require lodging, restaurants, sporting goods, guides and outfitting services, food, fuel, and other associated supplies. Big-game hunting, in particular, is viewed as critical to Garfield County, and especially the local community economies that depend on BLM and U.S. Forest Service (USFS) public lands where most hunting occurs (BLM 2006). Expenditures by hunters in the Roan Plateau Planning Area alone have been estimated to be as much as $1 million annually, with perhaps an additional $1 million annually of indirect and local expenditures (CPW 1995, cited in BLM 2006).

The growth of the oil and gas industry in the past 10 years has been increasingly important to local economies (BLM 2006). Production of natural gas in Garfield County increased dramatically during recent years, from approximately 70 bcf in 2000 to 576 bcf in 2009 (COGCC 2010). In addition, Garfield County is experiencing the fastest increase in oil and gas development in Colorado, with over 2,000 drilling permits currently approved between July 2009 and September 2010 (COGCC 2010). While the number of workers employed in the mining and extraction industry in Garfield County has been shown to be only 1.7%, this number is considered misleading because some oil and gas employment has been incorporated as part of the construction sector statistics instead (BLM 2006). For example, in 2005, an estimated 4,000 persons were directly employed by gas development companies and their subcontractors in Garfield County (Garfield County 2009).

The Federal government makes "Payments in Lieu of Taxes" (PILT) to county governments to help offset property tax revenue lost for nontaxable Federal lands within the county (BLM 2006). Payments are based on Federal acreage in the county for all land management agencies, including BLM, USFS, USFWS, and National Park Service. The amount may also be adjusted based on population and as appropriated by Congress. By formula, payments are decreased as other funds, such as mineral royalty payments, increase. Approximate PILT received by Garfield County in recent years has been as follows: $0.8 million in 2005; $1.1 million in 2006, 2007, and 2008; and $1.9 million in 2009 (USDI 2010).

Property tax revenue from oil and gas development has become the largest source of public revenue in Garfield County (BLM 2006), with an assessed valuation in Garfield County of approximately $3.8 billion, or 74% of the total. Total tax revenues from property taxes and special district levies were $130 million. Tax dollar distributions in 2009 were Schools – 30.4%, County – 32.3%, Special Districts – 14.3%, Fire Districts – 12.3%, Colleges – 8.9%, and Towns – 1.7% (Garfield County 2009).

In addition to PILT payments, BLM shares revenue generated by commercial activities on public lands with state and county governments (BLM 2006). 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. Half the royalty receipts are distributed to Colorado, and the amount distributed to Garfield County in 2002 attributable to oil and gas production was $14.1

million. In 2001, the amount was $5.5 million (BLM 2006). These funds are then allocated to fund county services, schools, and local communities.

The NEPA process requires a review of the environmental justice issues as established by Executive Order 12898 (February 11, 1994). The order established that each Federal agency identify any "disproportionately high and adverse human health or environment effects of its programs, policies, and activities on minority and low-income populations." The Hispanic/Latino community is the only minority population of note in the project vicinity. In 2010, approximately 28% of the residents of Garfield County identified themselves as Hispanic/Latino, compared to 17% in 2000. Statewide, the percentage of Hispanic/Latino residents grew from 17% to 21% during the same 10-year period. African-American, American Indian, Asian, and Pacific Islander residents accounted for a combined 2.6% of the Garfield County population in 2010, compared to a statewide level of 8% (CDLE 2010).

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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts to socioeconomics—both negative and positive—would be reduced compared to the Proposed Action but not eliminated.

Soils

Affected Environment

The J24 NW 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 entire pad lies within the Arvada loam

The Arvada loam is a well-drained, moderately sloping (6 to 20% slopes) soil found on alluvial fans and high terraces with elevations ranging from 5,100 to 6,200 feet. This soil is formed in highly saline alluvium derived from shale and sandstone. The permeability is slow, runoff is rapid and erosion hazard is severe. This soil is generally used for grazing and wildlife habitat and limited grazing.

Environmental Consequences

The Proposed Action would involve surface disturbance to expand the existing pad on fee surface. The Proposed Action would result in approximately 8.25 acres of short-term vegetation loss and soil compaction and displacement on private lands. After reclamation the long-term surface disturbance would be reduced to 1.75 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 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. 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 7 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity, and potential for adverse impacts.

Table 7. Potential for Occurrence of Threatened or Endangered Plant Species

Species and Status	*Occurrence*	*Habitat Association*	*Range or Habitat in Vicinity?*	*Potentially Affected?*
Parachute penstemon *(Penstemon debilis)* -- 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 *(Phacelia submutica)* – 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

Table 7. Potential for Occurrence of Threatened or Endangered Plant Species				
Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
Colorado hookless cactus *(Sclerocactus glaucus)* – 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 ladies'-tresses orchid *(Spiranthes diluvialis)* – Threatened	Subirrigated alluvial soils along streams and in open meadows in floodplains; 4,500 to 7,200 feet	Box-elders, cottonwoods, willows, scouring rushes, and riparian grasses, sedges, and forbs	No	No

Environmental Consequences

Proposed Action

Because the habitat types in and around the project area are unsuitable for any of the Federally listed plant species with the potential to occur in Garfield County, 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 of the Federally listed plant species with the potential to occur in Garfield County, 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 8 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. No suitable habitat for any BLM sensitive plant species exists within or near the project area.

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 any BLM sensitive plant species.

Table 8. Potential for Occurrence of BLM Sensitive Plant Species				
Species	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
DeBeque milkvetch (*Astragalus debequaeus*)	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 (*Astragalus naturitensis*)	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	No	No
Piceance bladderpod (*Lesquerella parviflora*)	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 (*Mentzelia rhizomata*)	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 (*Penstemon harringtonii*)	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200 to 9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	No	No
Cathedral Bluffs meadow-rue (*Thalictrum heliophilum*)	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

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. 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 affected by projects within the County. These species, their status, and their distributions and habitat associations in the region are listed in Table 9.

Table 9. Potential for Occurrence of Threatened or Endangered Animal Species				
Species and Status	**Distribution in Region**	**Preferred Habitats**	**Potentially Present in Vicinity?**	**Potentially Adversely Affected?**
Canada lynx *(Lynx canadensis)* – 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 *(Coccyzus americanus)* –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 (*Strix occidentalis lucida*) – 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 *(Xyrauchen texanus)* – 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 *(Ptychocheilus lucius)* – Endangered			**Yes**	**Yes**
Humpback chub *(Gila cypha)* -- 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 *(Gila elegans)* – Endangered			No	**Yes**
"Lineage GB" cutthroat trout (*Oncorhynchus clarki* 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

Razorback Sucker (*Xyrauchen texanus*), Colorado Pikeminnow (*Ptychocheilus lucius*), Humpback Chub (*Gila cypha*), and Bonytail Chub (*G. elegans*). 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. 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 10. Species indicated in the table as present or possibly present in the project vicinity are described more fully following the table.

Table 10. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area

Common Name	***Habitat***	***Potential for Occurrence***
Fringed myotis (*Myotis thysanodes*)	Roosting: Caves, trees, mines, and buildings. Foraging: Pinyon-juniper, montane conifers, and semi-desert shrubs.	Possible
Townsend's big-eared bat (*Corynorhinus townsendii*)		
Northern goshawk (*Accipiter gentilis*)	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 (Haliaeetus leucocephalus)	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 (*Falco peregrinus*)	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 (Spizella breweri)	Extensive stands of sagebrush, primarily Wyoming sagebrush on level or undulating terrain.	Possible – habitat marginal
Midget faded rattlesnake (*Crotalus oreganus concolor*)	Cold desert of NW Colorado, SW Wyoming, and NE Utah, primarily in sagebrush with rock outcrops and exposed canyon walls.	Possible – habitat marginal
Great Basin spadefoot (*Spea intermontana*)	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	No suitable habitat
Northern leopard frog (*Lithobates pipiens*)	Clean, perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Possible
Bluehead sucker (*Catostomus latipinnis*)	Primarily smaller streams with a rock substrate and mid to fast- moving waters; also shallows of larger rivers.	Not present
Flannelmouth sucker (*Catostomus discobolus*)	Runs, riffles, eddies, and backwaters in large rivers.	Present in Colorado River
Roundtail chub (*Gila robusta*)	Slow-moving waters adjacent to fast waters in large rivers.	
"Lineage CR" cutthroat trout (*Oncorhynchus clarki* 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 (*Myotis thysanodes* and Townsend's Big-eared Bat (*Corynorhinus townsendii*) – 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 (*Accipiter gentilis*) – 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 (*Haliaeetus leucocephalus*) – 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 (*Falco peregrinus*) – 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 (*Spizella breweri*) – 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.

Midget Faded Rattlesnake (*Crotalus oreganus concolor*) - This species is mostly limited to areas with rock outcrops that provide escape cover, thermal cover, and especially hibernacula. These are crucial components for reproduction and survival and are uncommon in the project vicinity. Though the midget faded rattlesnake is known to occur in northwestern Colorado in a variety of habitats, including pinyon and juniper woodlands, it is not expected to occur in the project area.

Northern Leopard Frog (*Lithobates pipiens*) – The northern leopard frog is limited to perennial waters, including ponds and slow-flowing perennial streams or persistent portions of intermittent streams. It requires good water quality and abundant aquatic or shoreline vegetation. The habitat along Mamm Creek appears marginally suitable for the species, but no leopard frogs have been reported during fish surveys or other surveys of the stream. Because the project would not involve habitat disturbance near water sources, impacts to this species are not expected.

Flannelmouth Sucker (*Catostomus latipinnis*) – As with the endangered Colorado River fishes described previously, the flannelmouth sucker is 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, this species is adapted to naturally high sediment loads and therefore would not be affected by increased sediment transport to the Colorado River. However, it is 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on BLM sensitive animal species would be less than under the Proposed Action but not eliminated.

Vegetation

Affected Environment

The project area lies at the upper edge of a sagebrush-grassland habitat type, with steeper slopes above the project area dominated by pinyon-juniper (*Juniperus osteosperma-Pinus edulis*) woodlands. A total of 4.31 acres was previously disturbed with the initial construction of the J24 pad. Of this, 3.08 acres underwent temporary reclamation seeding with native grass species and is currently well vegetated with a mix of predominantly non-native grass species including crested wheatgrass (*Agropyron cristatum*), intermediate wheatgrass (*Thinopyrum intermedium*), and Russian wild rye (*Psathyrostachys juncea*). One native shrub species, fourwing saltbush (*Atriplex canescens*), has also established within the reclaimed area. Common invasive non-native species here include kochia (*Bassia scoparia*), salsify (*Tragopogon dubius*), Russian thistle (*Salsola tragus*), and yellow sweetclover (*Melilotus officinalis*), and these are mostly concentrated near the existing pad perimeter and access road. Within this reclaimed area, grass cover is approximately 70%, with an additional 7% of non-native herbaceous plant cover.

The vegetation below the existing well pad is dominated by Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), with some basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) in the shallow draws. Greasewood (*Sarcobatus vermiculatus*) and shadscale (*Atriplex confertifolia*) bushes grow interspersed among the sagebrush. Cheatgrass dominates the herbaceous understory.

Above the existing well pad, pinyon-juniper woodland dominates the overstory vegetation, with a sparse understory of forbs, grasses, and Wyoming sagebrush. Weed densities increase along a low ridgeline to the west where livestock appear to concentrate near outcrops of sandstone. Cheatgrass and Russian thistle are common throughout this area. Common native species include fourwing saltbush, rubber rabbitbrush (*Ericameria nauseosus*), shadscale, rose heath (*Chaetopappa ericoides*), scarlet globemallow (*Sphaeralcea coccinea*), and Sandberg bluegrass (*Poa secunda*). Claret cup cactus (*Echinocereus triglochidiatus*) grows around the sandstone outcrops.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 8.52 acres would be disturbed, of which 1.23 acres comprises the existing pad disturbance, and 3.08 acres would occur on previously disturbed and reclaimed areas. A

total of 4.21 acres of new disturbance would occur within Wyoming sagebrush vegetation, and this native vegetation would be converted to reclamation vegetation. Following construction completion, 6.95 acres would undergo temporary reclamation seeding. A total of 1.75 acres would remain as long-term disturbance. All of the disturbance would occur on private land. The proposed disturbance would increase the site's vulnerability to invasion and establishment of noxious weeds and other non-native invasive plant species. Because this site is owned by a private landowner, the plant species used for temporary reclamation would be determined by 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 cheatgrass establishment I 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on vegetation would be less but not eliminated.

Visual Resources

Affected Environment

The Proposed Action is located on split-estate (private surface underlain by Federal minerals) less than 1 mile south of the Garfield County Regional Airport in Rifle. Visual resource management (VRM) objectives do not apply to non-BLM lands, and visual values for those lands are protected by land owner discretion. The BLM can only make recommendations to mitigate impacts to scenic values.

The Proposed Action sits at the northern extent of Hunter Mesa, a generally flat mesa that gently slopes upward from the Colorado River Valley south to the West Mamm Creek drainage. Hunter Mesa is bound by the Colorado River to the North, Mamm Creek to the east, West Mamm Creek to the South, and Dry

Creek to the West. The northern end of Hunter Mesa consists of rolling hills that break up the general flatness that is characteristic of the remainder of Hunter Mesa. The area is characteristic of agricultural and ranching land, light industrial and oil and gas development, and electric transmission lines. Vegetation consists of sparse patches of sagebrush with a grass understory (predominantly on the flatter surface areas) and patches of pinyon juniper on the rolling hillside slopes.

The proposed project area is located near County Road 333 (Hunter Mesa Road) and County Road (CR) 352 (Garfield County Airport Road). The existing J24NW well pad sits within the Garfield County Airport Industrial Park P.U.D. at the toe of the rolling hills that are characteristic of the northern end of Hunter Mesa (Figure 5).

Figure 5. View southwest from the junction of Rifle Shop Access Road and County Road 352.

The visual resource analysis area includes the Rifle Shop Access Road and CR 352. This viewshed is important, as it is viewed by people who live, work, and commute in the area, and who constitute the typical casual observer. The Proposed Action is within the foreground/middle ground (3 to 5 miles) of these travel corridors. 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.

Environmental Consequences

Proposed Action

Short-term visual impacts due to pad construction and drilling and completion activities would occur within the project area. Construction of the Proposed Action would create contrast within the landscape by removing the existing vegetation, exposing bare ground, and creating distinct lines and forms within the landscape. The well pad expansion and associated surface facilities would increase the presence of drilling rigs, heavy equipment (e.g., dozers, graders, trackhoes), and vehicular traffic with an associated increase in dust and light pollution.

Long-term impacts of the Proposed Action would consist of an increase in the departure from the native characteristics of the visual character within the landscape where the pad expansion and facilities are constructed. The visibility of new areas of surface disturbance and production equipment would increase the existing visual contrasts associated with human modification already present in the area.

The pad would be 450 feet x 378 feet in size, with a maximum cut of 35 feet at the south corner and a maximum fill of 22 feet at the north corner for a total of 8.52 acres of surface disturbance. The topography surrounding the existing well pad forms a horse shoe shape that opens to the north and encloses the pad location to the south. Views into the project area would be blocked by this topography from the west, south and east. The northern side of the Proposed Action is more exposed and would be the most visible in the short-term during construction and completion operations. However, once the pad is reclaimed, the 35-foot cut slope and 22-foot fill slope would be recontoured leaving less dramatic cut/fill slopes and a smaller production working surface footprint of 1.75 acres.

Since the pad occurs entirely on private land, the standard Best Management Practices (BMPs) related to reclamation, facility paint colors, and screening the production facilities from view would mitigate the visual impacts of the project.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. Therefore, impacts on visual resources would be less than under the Proposed Action but not eliminated.

Wastes, Hazardous or Solid

Affected Environment

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

BLM Instruction Memoranda numbers WO-93-344 and CO-97-023 require that all 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, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. Therefore, impacts associated with hazardous or solid wastes would be less than under the Proposed Action but not eliminated.

Water Quality, Surface and Ground

Surface Water

Affected Environment

The proposed activities for J 24NW would occur within Dry Creek unit which drains the Colorado River. The unnamed east branch of Dry Creek flows north to Dry Creek and ultimately empties into the Colorado River approximately 2 miles to the northwest of the project. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007), unnamed ephemeral drainages that drain most of the project vicinity are within segment 4e, which is the mainstem of Dry Creek including all tributaries and wetlands from the source to immediately above last chance ditch. Following is a brief description of segment 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.

The segment of the Colorado River which Dry 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 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 11.

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 11. Selected Water Quality Data for Two Nearby Sampling Locations on the Colorado River

Parameter	***USGS Site #09092570 01/18/1978***	***USGS Site #09092570 4/8/1977***
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 CaCO3 (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 8.52 of surface disturbance of which approximately 1.75 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 cutslope on the pad. A traditional reserve pit would not be constructed. Completions may be conducted either onsite or remotely and fluids may be stored in surface containment or a pit. 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 well would not be approved. However, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. Therefore, impacts on surface water resources would be less than under the Proposed Action but not eliminated.

Waters of the U.S.

Affected Environment

Waters of the U.S. located in the project vicinity include the mainstem and tributaries of Dry 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). The pad expansion may temporarily fill ephemeral drainages which are tributary to Dry Creek. Fill into a drainage which is considered a Waters of the U.S. would require a USACE permit.

Environmental Consequences

Proposed Action

Construction of the north corner of the J24 NW pad could discharge fill into Waters of the U.S. require USACE NWP. Based on the estimated impacts to waters of the U.S., any fill and diversion of a drainage would be authorized by the USACE. A COA listed in Appendix A required that the operator obtain a formal jurisdictional determination by USACE prior to any construction that could affect Waters of the U.S., and verification that the impacts do not require a permit.

No Action Alternative

Under the No Action Alternative, the proposed Federal well would not be approved. However, Encana may drill, complete, and produce additional private minerals wells from this existing split-estate surface location. Therefore, impacts on Waters of the U.S. would be less than under the Proposed Action but not eliminated.

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).

Seven permitted domestic water wells are located within a 1-mile radius of the proposed project, however only two of the wells have any associated completion data. The two wells with data are located approximately 0.75 mile northeast of the proposed well site. The closer of the two is 203 feet deep, has a

static water level of 96 feet below ground surface (bgs), and has a discharge rate of 1.5 gallons per minute. The other well is 400 feet deep, has a static water level of 285 feet bgs, and has a discharge rate of 2 gallons per minute. Both are listed as domestic use.

Environmental Consequences

Proposed Action

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

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

Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

For decades, oil and gas companies and independent geophysicists have used state of the art equipment to monitor microseismic activity—defined as a "faint" or "very slight" tremor—during hydraulic fracturing to optimize well completions and to gather information about fracture dimensions and propagation (Warpinksi 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 depth of the well can be estimated.

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

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

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

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

No single list of chemicals currently used in hydraulic fracturing exists for western Colorado, and the exact combinations and ratios used by operators are considered proprietary. However, the general types of compounds and relative amounts used are well known and relatively consistent (Table 11).

Table 11. Constituents of Typical Hydraulic Fracturing Operation in Tight Gas Formations

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

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

Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 11 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 11 being drawn from a total of 59 listed on the FracFocus

website—the vast bulk of fluid injected into the formation during the process is water mixed with sand, representing 99.51% of the total by volume in the typical mixture shown in Table 11. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

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

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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on groundwater resources would be less than under the Proposed Action but not eliminated.

Wildlife, Aquatic

Affected Environment

Aquatic habitat is limited in the project area given the intermittent nature of the streams. Mamm Creek lies approximately 1.5 miles to the east of the J24NW pad. Though 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 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 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 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 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on aquatic wildlife would be less the Proposed Action but not eliminated.

Wildlife, Terrestrial

Affected Environment

MAMMALS

The site is located within winter range and the winter concentration area for mule deer (*Odocoileus hemionus*) and American elk *(Cervus elaphus)* as mapped by CPW (2010). 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

As mentioned in the section on Migratory Birds, raptors potentially nesting in the pinyon and juniper throughout the project vicinity include two small resident hawks (Cooper's hawk, sharp-shinned hawk) and, where taller conifers are present for nesting or perching, two larger resident raptors (red-tailed hawk and great horned owl). Other birds of prey potentially present include three small owls: the migratory flammulated owl (*Otus flammeotus*) and the resident northern pygmy-owl (*Glaucidium gnoma*) and

northern saw-whet owl (*Aegolius acadicus*), the latter two primarily where tall conifers are tall deciduous trees are present among the shrubs.

Other resident or short-distance migratory species in the project vicinity include the northern flicker (*Colaptes auratus*), common raven (*Corvus corax*), black-billed magpie (*Pica hudsonia*), American robin (*Turdus migratorius*), western meadowlark (*Sturnella neglecta*), blue-gray gnatcatcher (*Polioptila caerulea*), and house finch (*Haemorhous mexicanus*). See the sections on Migratory Birds and Special-Status Species for discussions of other birds in the area.

REPTILES

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. Some existing stock ponds and slow-flowing portions of the drainages are potentially suitable for the northern leopard frog, though none have been documented.

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 8.52 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, Encana may drill, complete, and produce additional private oil and gas wells from this existing split-estate surface location. Therefore, impacts on aquatic 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.

None of the cumulative impacts was described in the 1999 FSEIS (BLM 1999a) as significant, and the more recent air quality modeling published in 2011 also indicated no significant cumulative impacts on that resource. In addition, new technologies and regulatory requirements have reduced the impacts of some land uses. Nonetheless, the past, present, and reasonably foreseeable future actions of the type analyzed in this EA, and of other types of industrial use, have had and would continue to have adverse effects on various elements of the human environment. Anticipated impacts for past, present, and future actions range from negligible to locally major, and primarily negative, for specific resources. The primary bases for this assessment are twofold:

1. The rate of development, particularly oil and gas development, while somewhat variable through time due to economic and other factors, has continued and is expected to continue into the foreseeable future. Notwithstanding the current slowdown in the rate of development, increases in natural gas prices and unknown technological advances or changes in the geopolitical climate could result in more rapid development in the future.

2. Residential and commercial expansion, as well as most of the oil and gas development, has occurred on private lands where mitigation measures designed to protect and conserve resources may not be applied to the same extent as on BLM lands. Recent COGCC regulations have closed considerably the gap between the potential environmental impacts associated with development of private versus Federal fluid mineral resources.

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 12.

Table 12. BLM Interdisciplinary Team Authors and Reviewers

Name	*Title*	*Areas of Participation*

Table 12. BLM Interdisciplinary Team Authors and Reviewers		
Name	***Title***	***Areas of Participation***
D. J. Beaupeurt	Realty Specialist	Lands and Realty
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Christine Cimiluca	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid.
Peter Cowan	Petroleum Engineer	Downhole COAs
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	NEPA Review, General Technical Review
Shauna Kocman, Ph.D., P.E.	Petroleum Engineer, Air Program Lead	Air Quality, Noise, Soils, Surface Water, Waters of the U.S.
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 COAS APPLICABLE TO ALL ACTIVITIES FOR EA #DOI-BLM-CO-N040-2013-0028

The following standard surface-use 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.

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

2. Road Construction and Maintenance. Roads shall be crowned, ditched, surfaced, drained with culverts and/or water dips, and constructed to BLM Gold Book standards. Initial gravel application shall be a minimum of 6 inches. The operator shall provide timely year-round road maintenance and cleanup on the access roads. A regular schedule for maintenance shall include, but not be limited to, blading, ditch and culvert cleaning, road surface replacement, and dust abatement. When rutting within the traveled way becomes greater than 6 inches, blading and/or gravelling shall be conducted as approved by the BLM.

3. Dust Abatement. The operator shall implement dust abatement measures as needed to prevent fugitive dust from vehicular traffic, equipment operations, or wind events. The BLM may direct the operator to change the level and type of treatment (watering or application of various dust agents, surfactants, and road surfacing material) if dust abatement measures are observed to be insufficient to prevent fugitive dust.

4. Drainage Crossings and Culverts. Construction activities at perennial, intermittent, and ephemeral drainage crossings (e.g. burying pipelines, installing culverts) shall be timed to avoid high flow conditions. Construction that disturbs any flowing stream shall utilize either a piped stream diversion or a cofferdam and pump to divert flow around the disturbed area.

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

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

5. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into Waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent

impacts to jurisdictional waters may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 17. Copies of any printed or emailed approved USACE permits or verification letters shall be forwarded to the BLM.

6. Wetlands and Riparian Zones. The operator shall restore temporarily disturbed wetlands or riparian areas. The operator shall consult with the BLM Colorado River Valley Field Office to determine appropriate mitigation, including verification of native plant species to be used in restoration.

7. Reclamation. The goals, objectives, timelines, measures, and monitoring methods for final reclamation of oil and gas disturbances are described in Appendix I (Surface Reclamation) of the 1998 Draft Supplemental EIS (DSEIS). Specific measures to follow during interim reclamation are described below.

   a. Reclamation Plans. In areas that have low reclamation potential or are especially challenging to restore, reclamation plans will be required prior to APD approval. The plan shall contain the following components: detailed reclamation 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 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 reseedings 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% of the new plants are producing seed. The BLM will approve the type of fencing.

j. Monitoring. The operator shall conduct annual monitoring surveys of all sites categorized as "operator reclamation in progress" and shall submit an annual monitoring report of these sites to the BLM by **December 31** of each year. The monitoring program shall use the four Reclamation Categories defined in Appendix I of the 1998 DSEIS to assess progress toward reclamation objectives. The annual report shall document whether attainment of reclamation objectives appears likely. If one or more objectives appear unlikely to be achieved, the report shall identify appropriate corrective actions. Upon review and approval of the report by the BLM, the operator shall be responsible for implementing the corrective actions or other measures specified by the BLM.

8. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive Weed Management Plan for Oil and Gas Operators*, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports and Pesticide Application Records (PARs) shall be submitted to the BLM by **December 1**.

9. Big Game Winter Range Timing Limitation. To minimize impacts to wintering big game, no construction, drilling or completion activities shall occur during a Timing Limitation (TL) period from **December 1 to April 30 annually**.

10. Bald and Golden Eagles. It shall be the responsibility of the operator to comply with the Bald and Golden Eagle Protection Act (Eagle Act) with respect to "take" of either eagle species. Under the Eagle Act, "take" includes to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest and disturb. "Disturb" means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior. Avoidance of eagle nest sites, particularly during the nesting season, is the primary and preferred method to avoid a take. Any oil or gas construction, drilling, or completion activities planned within 0.5 mile of a bald or golden eagle nest, or other associated activities greater than 0.5 miles from a nest that may disturb eagles, should be coordinated with the BLM project lead and BLM wildlife biologist and the USFWS representative to the BLM Field Office (970-876-9051).

11. Raptor Nesting. Raptor nest surveys in the project vicinity resulted in the location of one or more raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. 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 May 1 to July 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).

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

13. Migratory Birds – General. It shall be the responsibility of the operator to comply with the Migratory Bird Treaty Act (MBTA) with respect to "take" of migratory bird species, which includes injury and direct mortality resulting from human actions not intended to have such result. To minimize the potential for the take of a migratory bird, the operator shall take reasonable steps to prevent use by birds of fluid-containing pits associated with oil or gas operations, including but not limited to reserve pits, produced-water pits, hydraulic fracturing flowback pits, evaporation pits, and cuttings trenches.

Liquids in these pits—whether placed or accumulating from precipitation—may pose a risk to birds as a result of ingestion, absorption through the skin, or interference with buoyancy and temperature regulation.

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

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

14. Range Management. Range improvements (fences, gates, reservoirs, pipelines, etc.) shall be avoided during development of natural gas resources to the maximum extent possible. If range improvements are damaged during exploration and development, the operator will be responsible for repairing or replacing the damaged range improvements. If a new or improved access road bisects an existing livestock fence, steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock.

15. *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 stay shall be used for such purposes.

16. Paleontological Resources. All persons associated with operations under this authorization shall be informed that any objects or sites of paleontological or scientific value, such as vertebrate or scientifically important invertebrate fossils, shall not be damaged, destroyed, removed, moved, or disturbed. If in connection with operations under this authorization any of the above resources are encountered the operator shall immediately suspend all activities in the immediate vicinity of the discovery that might further disturb such materials and notify the BLM of the findings. The discovery must be protected until notified to proceed by the BLM.

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

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

    Pursuant to 43 CFR 10.4(g), the BLM shall be notified by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony. Further, pursuant to 43 CFR 10.4 (c) and (d), activities shall stop in the vicinity of the discovery, and the discovery shall be protected for 30 days or until notified by the BLM to proceed.

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

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

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

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

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

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

18. Visual Resources. Production facilities shall be placed to avoid or minimize visibility from travel corridors, residential areas, and other sensitive observation points—unless directed otherwise by the BLM due to other resource concerns—and shall be placed to maximize reshaping of cut-and-fill slopes and interim reclamation of the pad.

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

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

19. Windrowing of Topsoil. Topsoil shall be windrowed around the pad perimeter to create a berm that limits and redirects stormwater runoff and extends the viability of the topsoil per BLM Topsoil Best Management Practices (BLM 2009 PowerPoint presentation available upon request from Glenwood Springs Field Office). Topsoil shall also be windrowed, segregated, and stored along pipelines and roads for later spreading across the disturbed corridor during final reclamation. Topsoil berms shall be promptly seeded to maintain soil microbial activity, reduce erosion, and minimize weed establishment.

20. Reserve Pit. A minimum of 2 feet of freeboard shall be maintained in the reserve pit. Freeboard is measured from the highest level of drilling fluids and cuttings in the reserve pit to the lowest surface elevation of ground at the reserve pit perimeter.

21. Soils. Cuts and fills shall be minimized when working on erosive soils and slopes in excess of 30 percent. Cut-and-fill slopes shall be stabilized through revegetation practices with an approved seed mix shortly following construction activities to minimize the potential for slope failures and excessive erosion. Fill slopes adjacent to drainages shall be protected with well-anchored silt fences, straw wattles, or other acceptable BMPs designed to minimize the potential for sediment transport. On slopes greater than 50 percent, BLM personnel may request a professional geotechnical analysis prior to construction.

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.
Case Number:	COC56608A (COC56035)
Pad:	J24NW
Surface Location:	Garfield County; NWSE Sec. 24 T6S R93W
Engineer:	Peter Cowan

See list of wells following the COAs.

1. Twenty-four hours *prior* to (a) spudding, (b) conducting BOPE tests, (c) cementing/running casing strings, and (d) within 24 hours *after* spudding, the CRVFO shall be notified. One of the following CRVFO inspectors shall be notified by phone. The contact number for all notifications is: 970-876-9064. The BLM CRVFO inspectors are Julie King, Lead PET; David Giboo, PET; Greg Rios, PET; Tim Barrett, PET; and Alex Provstgaard, PET.

2. A CRVFO petroleum engineer shall be contacted for a verbal approval prior to commencing remedial work, plugging operations on newly drilled boreholes, changes within the drilling plan, sidetracks, changes or variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Contact 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 CRF 3160-9 (a).

13. Prior to commencing fracturing operations, the production casing shall be tested to the maximum anticipated surface treating/fracture pressure and held for 15 minutes without a 2% leak-off. If leak-off is found, Shauna Kocman or Peter Cowan shall be notified within 24 hours of the failed test, but prior to proceeding with fracturing operations. The test shall be charted and set to a time increment as to take up no less than a quarter of the chart per test. The chart shall be submitted with the well completion report.

14. During hydraulic frac operations, monitor the bradenhead/casing head pressures throughout the frac job. Frac operations shall be terminated upon any sharp rise in annular pressure (+/- 40 psi or greater) in order to determine well/wellbore integrity. Notify Shauna Kocman or Peter Cowan immediately.

15. Per 43 CFR 3162.4-1(c), no later than the 5th business day after any well begins production on which royalty is due anywhere on a lease site or allocated to a lease site, or resumes production in a case of a well which has been off production for more than 90 days, the operator shall notify the authorized

officer by letter or sundry notice, Form 3160-5, or orally to be followed by a letter or sundry notice, of the date on which such production has begun or resumed.

16. After drilling the surface casing for all wells, email Julie King, jjking@blm.gov, the casing tally and cementing report

Contact Information:

Shauna Kocman, PhD, PE
Petroleum/ Environmental Engineer

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

Peter Cowan
Petroleum Engineer

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

List of Well(s)			
Proposed Pads	**Proposed Wells**	**Surface Locations**	**Bottom Hole Locations**
J24NW Pad (Fee Surface)	Alp Federal 24-11B	T6S R93W, Sect. 24 NWSE	T6S R93W, Sect. 24 NWSE

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FONSI

DOI-BLM-CO-N040-2013-0028-EA

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

DECISION RECORD

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

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 any Federal wells will not commence until approval by BLM of Applications for Permit 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 any 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: March 7, 2013