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-N040-2014-0100-EA

CASEFILE NUMBER

Federal Oil and Gas Lease COC24603; BLM Rights-of-Way COC67026 (Caerus access road).

PROJECT NAME

MV 34-5 Pad Expansion and Ant Hill Road Improvements. The project is a proposal to drill nine Federal directional wells and three Federal horizontal wells from the existing MV 34-5 well pad. The project would include construction of 0.86 mile of new realigned access road in the Ant Hill area of Riley Gulch and conduct final reclamation work on 0.48 mile of development road removed from service. The proposed work would involve amending an existing BLM right-of-way (COC67026) to reflect the Ant Hill Road alignment change made with this project proposal.

PROJECT LOCATION

The project area is located within the Riley Gulch watershed approximately 3 air-miles west of Parachute, Garfield County, Colorado, in Township 7 South (T7S), Range 96 West (R96W), Section 5, Sixth Principal Meridian. The project area is accessed by Garfield County Road (CR) 215 (Parachute Creek Road) northwest of Parachute and west across private field development roads to the Riley Gulch Access Road. Public access is not available to the project area, since the field development road west of CR 215 crosses private land (Figure 1).

APPLICANT

WPX Energy Rocky Mountain LLC ("WPX"). Contact: Reed Haddock, 1001 Seventeenth Street, Suite 1200, Denver, Colorado 80202.

BACKGROUND

The existing MV 34-5 well pad, which currently supports five producing Federal oil and gas wells, has been in a state of interim reclamation since 2007 after the last drilling visit in 2005 (Figure 1). Located entirely on BLM land, the pad was initially constructed in 1991 with the drilling of a single Mesa Verde well named MV 34-5 well. A second drilling visit, occurring in 2001, produced the GM 33-5 directional well. The 2005 drilling visit resulted in an expansion of the MV 34-5 pad which produced three more directional wells that were analyzed in the Environmental Assessment (EA) for the South Grand Valley Geographic Area Plan (SGVGAP) #CO-140-2004-0034-EA, approved on April 13, 2004 (BLM 2004).

The MV 34-5 pad has a number of slumps in proximity, with the most active slump block located to the east appearing to be charged by seeps from a layer of sandstone. The pad has exhibited relatively stable conditions since the initial 1991 pad construction with the exception of slumping along the eastern side of the ridge. Geotechnical advice provided by Mike Berry of Huddleston-Berry Engineering & Testing, LLC during the planning for this proposed fourth drilling visit focused on avoiding the eastern slump block area and protecting the southern side of the existing pad from any additional disturbance. The planned expansion of the cutslope on the north side of the pad was designed with a 1:1 cutslope knowing that the area was previously disturbed during the 2005 drilling visit without any slump occurrence. Storing cuttings developed from the new wells against the cutslope within the designated cuttings management area would help provide mass to retain the integrity of the excavated cutslope. The relatively large volume of excess material developed from the pad reconstruction would be placed in two separate stockpiles along the west side of the pad within an historical slump area. Mr. Berry recommended a split of the excess material volume (40% upgradient, 60% downgradient) to help stabilize the soils within the old slump.

Since 2012, WPX has drilled two horizontal exploratory natural gas wells in the Riley Gulch drainage targeting the deep Niobrara formation. WPX is currently drilling two new Niobrara wells on the MV 28-4 pad located approximately 0.5 mile northeast of the MV 34-5 pad. WPX has identified the MV 34-5 pad as a step-out location for the exploratory Riley Gulch Niobrara program to further enhance their knowledge and efficiently develop the Niobrara formation. Niobrara drilling on the MV 34-5 pad would occur with a separate follow-up drilling visit after spring 2015. Drilling of three future Niobrara wells, however, would be analyzed in this EA.

ALTERNATIVES

Proposed Action

WPX proposes to drill and develop 12 new Federal oil and gas wells (up to three horizontal wells into the Niobrara formation and nine directional wells into the Williams Fork formation) from the existing, expanded MV 34-5 well pad located on BLM land (Figures 1 and 2). Two separate visits would be used to drill the different target formations with the directional well drilling occurring in spring 2015. The Niobrara wells would be drilled later in Summer-Fall 2015 or beyond.

The MV 34-5 pad would be expanded to a 3.63-acre disturbance footprint and built with a slightly atypical configuration primarily to avoid disturbance to the nearby slump areas (Figure 3). The pad would be designed with 1:1 cutslopes and 1½:1 fillslopes. About 25,000 cubic yards (cy) of excess material generated from the pad reconstruction would be stored in two separate piles (2.06 acres in size) south of the pad situated in proximity to the new road switchback that would serve the existing MV 34-5 pad and numerous fee pads to the south (map inset on Figure 2 and Figure 3). With the exception of the two excess material stockpiles and a portion of the cutslope along its western edge, the MV 34-5 pad reconstruction work would fall within the 2005 pad footprint.

Access Road Improvements.

The existing Riley Gulch private road provides serviceable, albeit challenging, access to the MV 34-5 pad particularly during inclement weather. The pad is located on a short, east-facing ridge below steep sandstone bands that surround the watershed (Figure 2). The pad lies about 1,500 feet west of a unique cone-shaped point in the watershed referred to as the "Ant Hill." The initial road was constructed in the 1980s and traverses the Ant Hill with a series of switchbacks ranging in grade from 15 to 20% for a sustained 1,750-foot pitch. Portions of the existing road system are near slump areas (Figure 4).

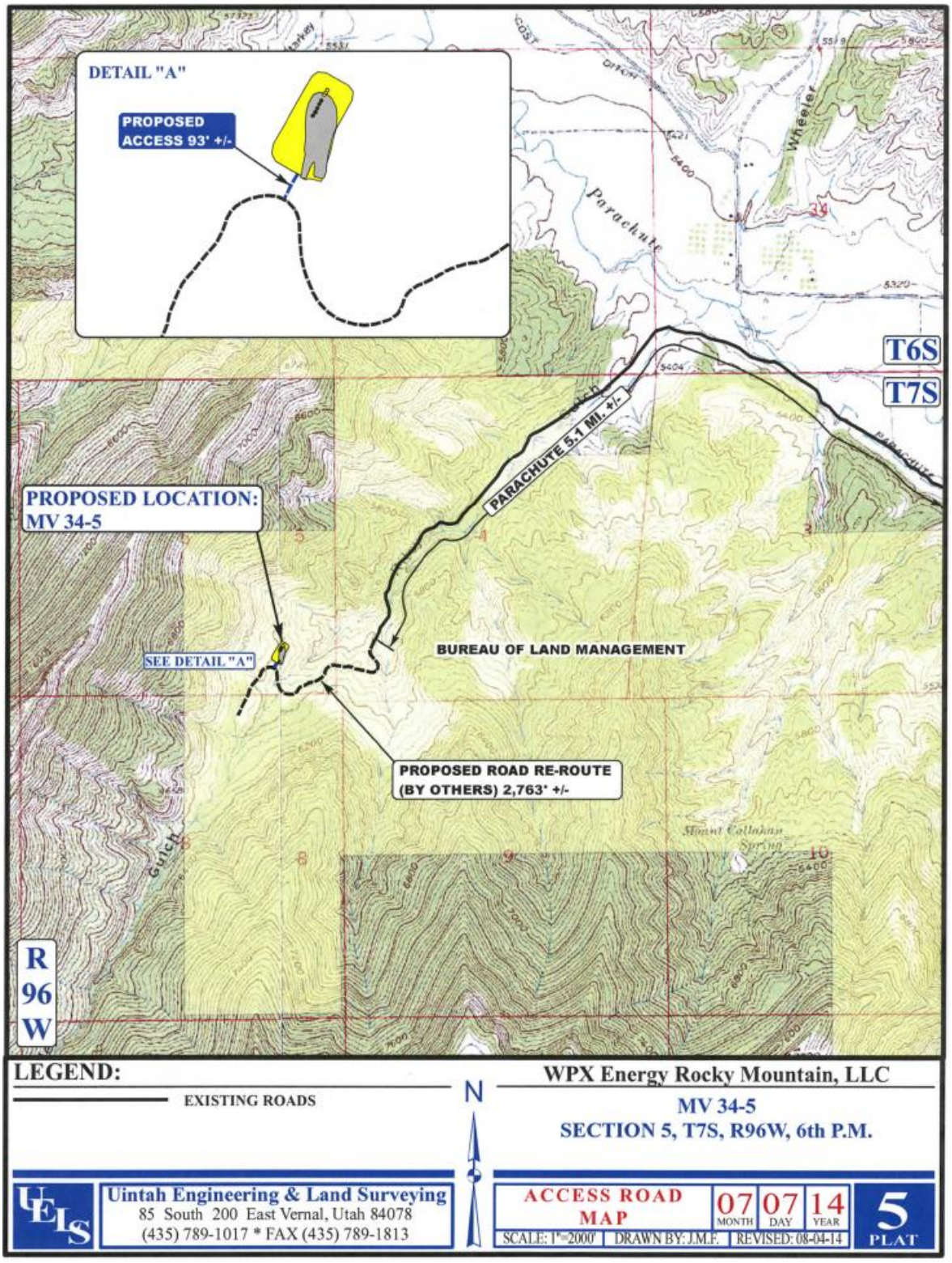

Figure 1. Project Location Map

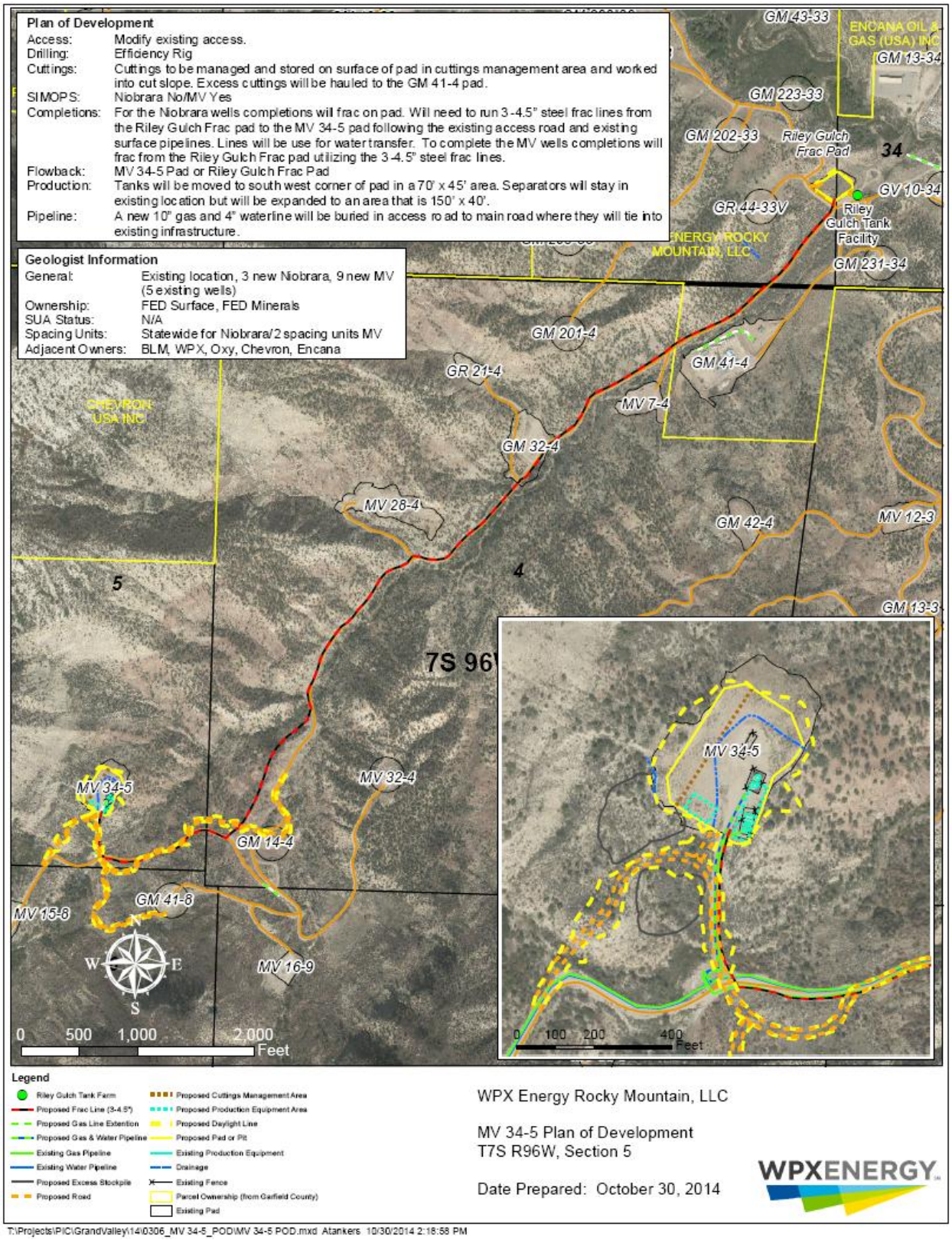

Figure 2. MV 34-5 Plan of Development

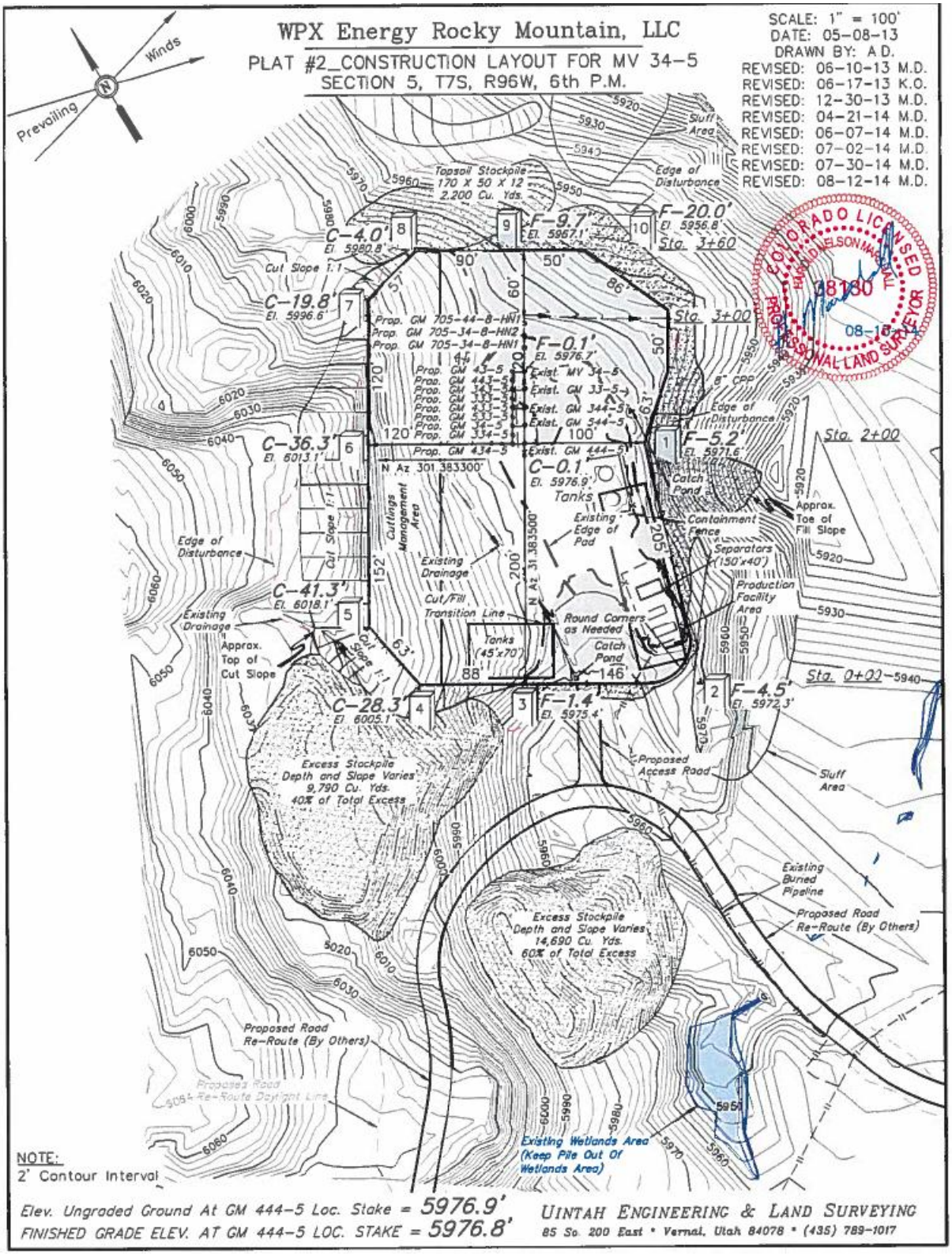

Figure 3. MV 34-5 Construction Layout (Update)

After years of planning and finalizing a road design package, WPX intends to upgrade the steep road on the Ant Hill with realigned road segments that significantly improve vehicle accessibility by reducing road grades and avoiding slump areas. The timing of the Ant Hill road work, however, would have to be conducted in phases to work around the upcoming winter weather and drilling schedule. The road improvements would entail 4,555 feet of new road segments and 2,550 feet of existing road segments that would be taken out of service and reclaimed back to natural contour. The MV 34-5 pad expansion work would be scheduled for spring 2015 to begin after the March 1 winter timing limitation is lifted.

The initial phase of the Ant Hill road work would likely be focused on the 1,400-foot MV 34-5 access road including the switchback realignment, major culvert installations and final Riley Gulch pipeline burial/final reclamation work south of the pad (Figure 4). This work could include the gas and water pipeline rerouting (including burying lines underneath Riley Gulch) and new pipeline connections to the MV 34-5 pad. The final reclamation of the Riley Gulch road/pipeline crossing uphill and west of the MV 34-5 pad could then be completed during the spring 2015 rig visit.

While the MV 34-5 pad is being reconstructed in Spring 2015, the new 1,155-foot segment from the MV 34-5 turnoff to the GM 41-8 pad would be accomplished to establish a new travel route to the top of the Ant Hill area and the 3 pads that road would serve (Figure 5).

A series of large diameter culverts would be installed in Riley Gulch near the MV 34-5 pad entrance (96-inch diameter), in a side ravine that feeds Riley Gulch southwest of the MV 34-5 pad (60-inch diameter) and numerous culverts related to the new road segments associated with the Ant Hill Road Work (Figure 6). The existing 48-inch diameter culvert located uphill from the MV 34-5 turnoff would be pulled during the new pipeline improvements and contribute greatly to the final reclamation of that segment (Figure 7).

The final phase of the road work would be include the new 2,000-foot road realignments on the Ant Hill area itself and be accomplished after the rig has finished drilling the 9 directional wells from the MV 34-5 pad (Figure 8). The objective would be to complete the entire Ant Hill Road Improvements before any new (post-Spring 2015) drilling visit would occur in the vicinity or above the Ant Hill. As the new road segments are placed into service, the old steep road sections would be closed to use, recontoured to natural topography, and reclaimed with desirable vegetation and functioning stormwater structures (Figure 4). The existing gas line valve works shown in two locations (green shading on Figure 4) would continue to be accessed along existing road segments to operate the valves and lubricate the fittings.

To provide safe access to the MV 34-5 pad during the Spring 2015 drilling visit, a dozer or motor patrol grader would have to chain up and pull over-sized or loaded vehicles up and down the steep Ant Hill road section for the duration of the planned drilling and completion work. Priority would be given to weekly road maintenance reviews, periodic spot graveling and blading, and constant attention to safely moving vehicles up and down the steep Ant Hill road grades. Once the final road improvements are completed after the spring 2015 drilling, it is anticipated that dozer pulls up the Ant Hill during rig moves would no longer be needed.

MV 34-5 Well Pad Details.

The nine new directional wells would be drilled in a new cellar that runs parallel to the 5 existing wellheads. The three Niobrara wells would have surface holes to the north of the Mesa Verde directional wells (Figure 3). The production equipment (separators, blowdown tank, and condensate storage tanks) would be staged on the southwest quadrant of the pad near the road entrance. Cuttings would be placed in a management area that runs the entire west side of the pad against the cutslope allowing the dried cuttings to be readily stacked during interim reclamation.

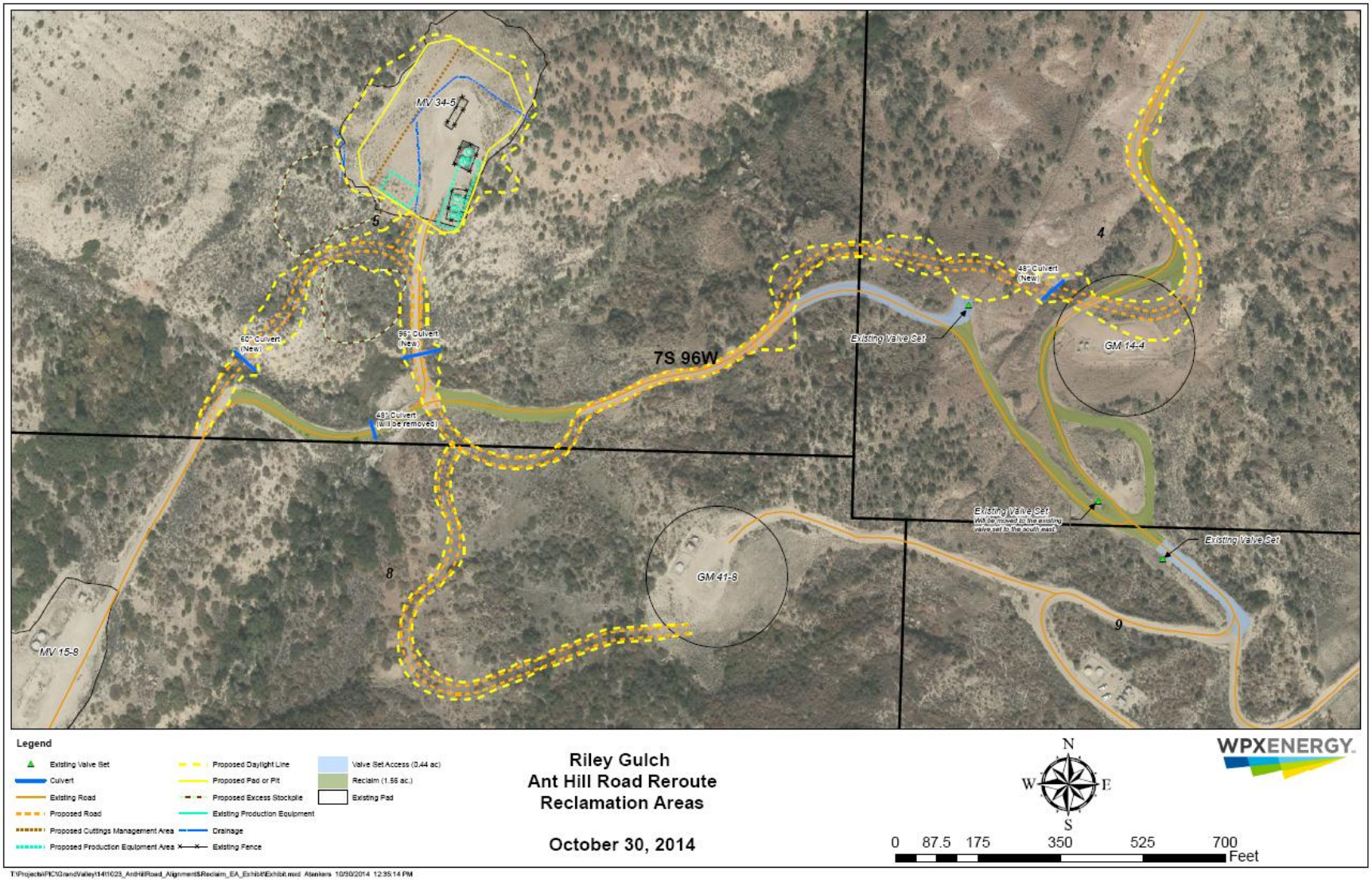

Figure 4. Ant Hill Road Improvement Plan

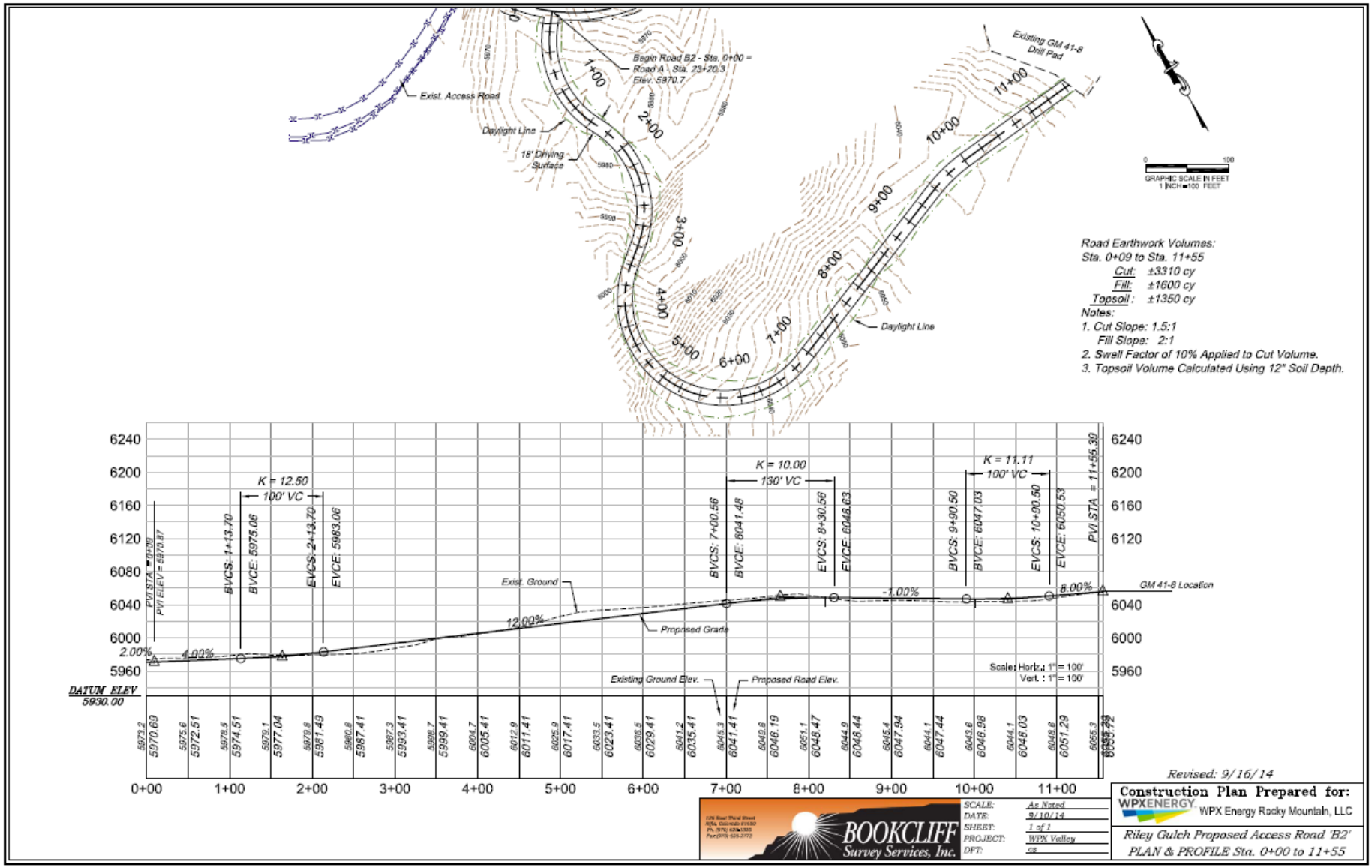

Figure 5. Phase 1 - New Road Connection to the GM 41-8 Pad.

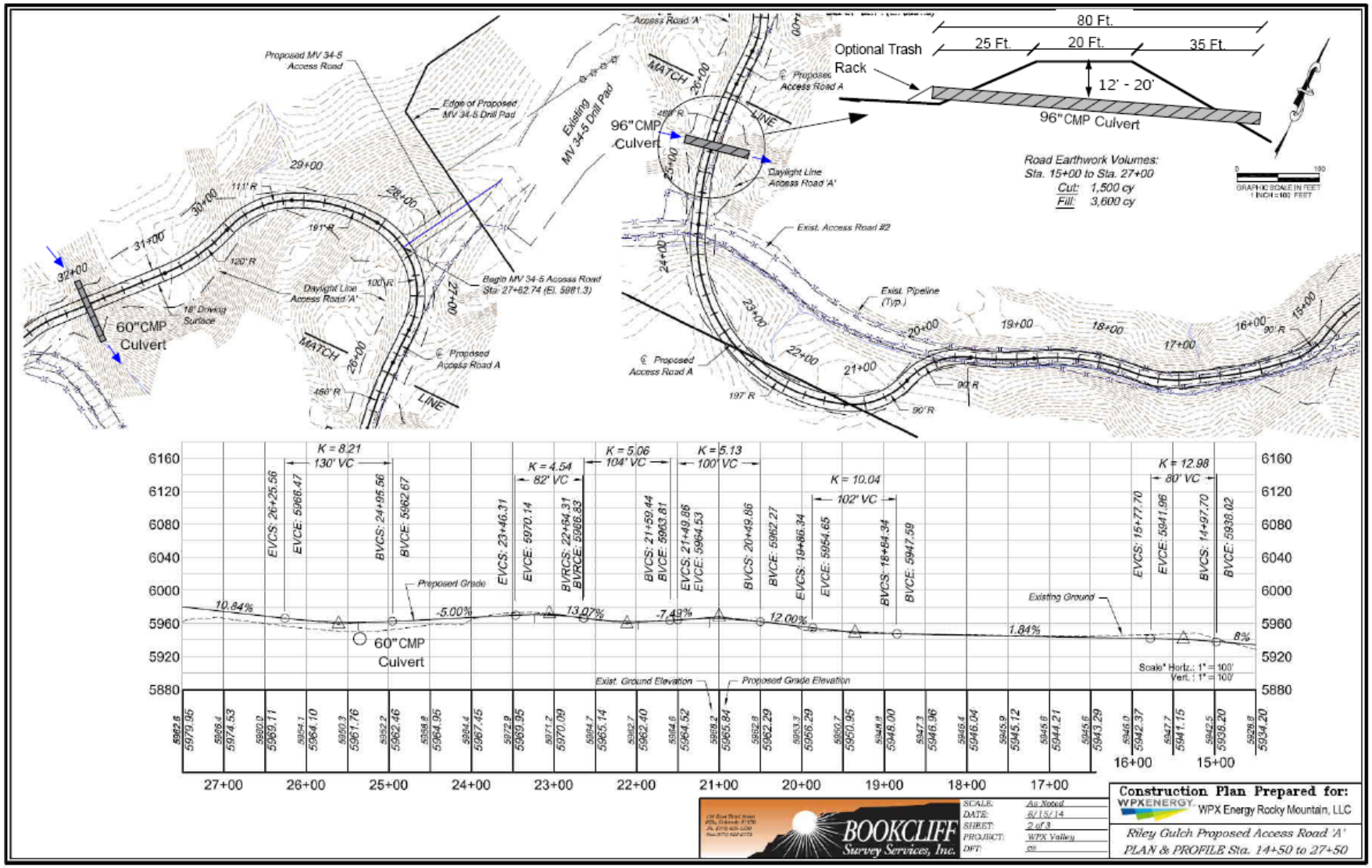

Figure 6. Phase 2 - Upper Riley Gulch Access Road Realignment with Major Culvert Installations

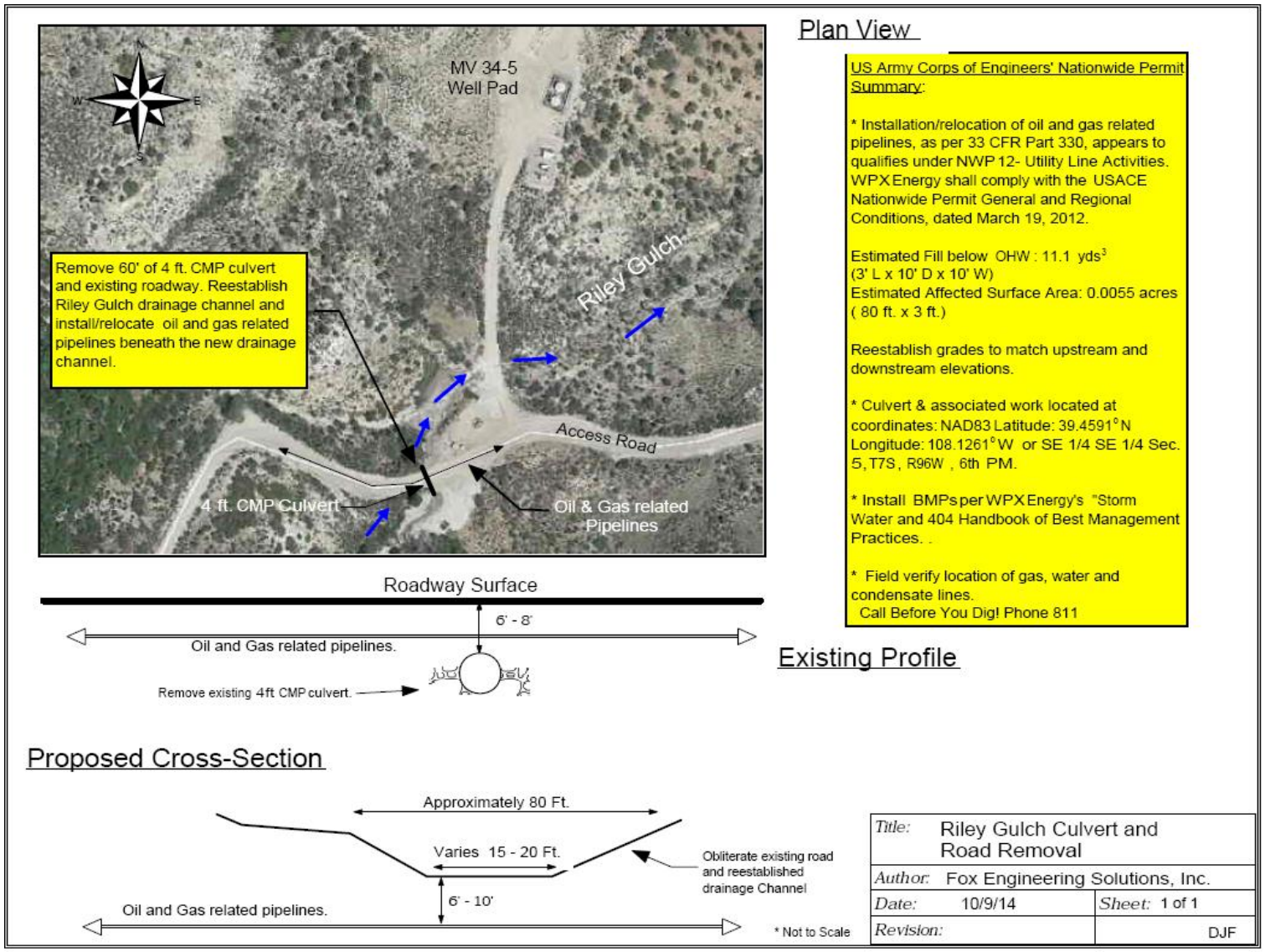

Figure 7. Road and Culvert Abandonment in Riley Gulch South of MV 34-5 Pad.

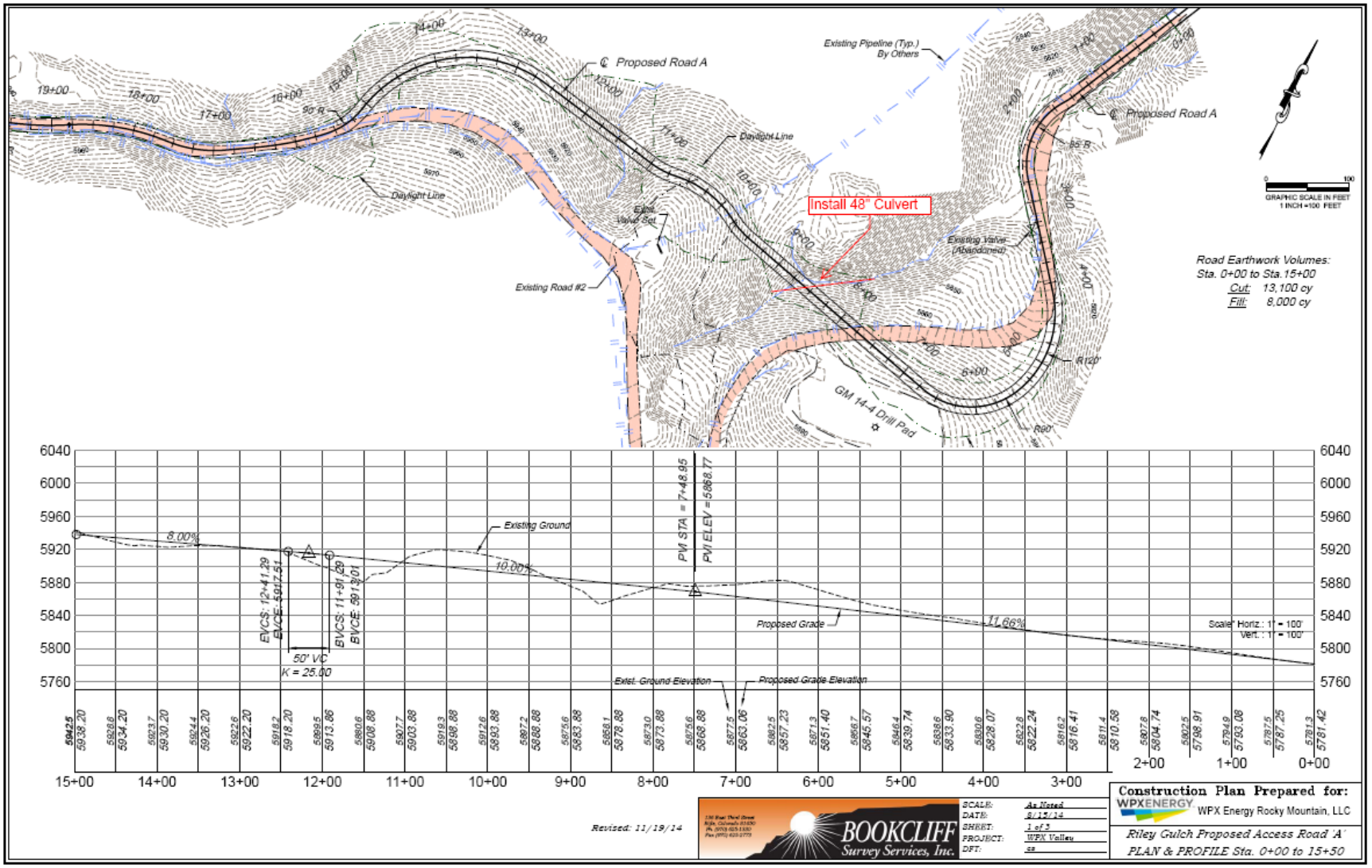

Figure 8. Phase 2 - Lower Riley Gulch Access Road Realignment.

A new 10-inch welded steel natural gas pipeline and 4-inch Flexsteel produced water collection line (both 525 feet in length) would be buried concurrently in the same trench from a connection point along the main road to the pad (Figure 2). Once connected with the Riley Gulch water line system, the produced water generated from the MV 34-5 wells would flow into the existing Riley Gulch collection line to the existing Riley Gulch Tank Facility and ultimately transferred via buried pipeline to the Parachute Water Treatment Facility for recycling. Oil truck transports would periodically haul condensate developed from the wells and stored in the tanks on the MV 34-5 pad.

Directional well drilling would be scheduled for spring 2015, with "simops" (simultaneous drilling and well completion operations) planned. As shown on Figure 2, the existing Riley Gulch Frac Pad would be the remote frac site to support the completion work for the new wells. Three 4½-inch-diameter welded steel surface lines providing water for the frac operations would connect with the existing surface frac lines supporting the MV 28-4 completions and be laid alongside the Riley Gulch Road and also laid cross-country along the existing surface gas lines on the Ant Hill. The surface frac lines, including the existing segment serving the MV 28-4 pad, would be 9,512 feet in length. The surface lines would eliminate the need for truck transports to deliver or collect water for the frac operations.

For the follow-up Niobrara drilling visit after spring 2015, the pad would likely remain open, as the forecasted period between drilling visits is not expected to be lengthy. Should the period between drilling visits exceed 12 months, interim reclamation of the MV 34-5 pad could be required based on a site review focusing on site stability and proper functioning stormwater structures. Cuttings management for the horizontal wells would likely require a site-specific plan involving off-site storage.

The MV 34-5 pad would be expanded primarily within the previous disturbance footprint while minimizing construction impacts to the eastern side of the ridge and avoiding any new disturbance impacts on the north edge of the pad. The new disturbance associated with the pad reconstruction would include 0.94 acre primarily along the west and south pad edges. The excess stockpiles would create another 2.06 acres of new disturbance. A maximum cut of 41.3 feet would occur at the southwest pad corner nearly mimicking the 2005 cutslope extent with the largest fill of 20.0 feet occurring at the northeast pad corner. As previously stated, the earthwork from the pad would yield a surplus of 25,000 cy. The excess material would be used in the construction of the road switchback, used in the major culvert installations, or stored in the two storage piles south of the pad (Figure 4).

Before the pad excavation begins, the few juniper trees and brush along the top of the cutslope would be cleared, broken down with equipment, and placed along the southern edge of the pad disturbance to serve as an erosion control structure with the windrowed topsoil. The topsoil would be stripped and placed in a continuous windrow around the pad with the exception of the steep eastern pad edge. This perimeter windrow of topsoil would serve as the primary stormwater control around the pad with catchments installed at the various release points along the pad edges. Topsoil would also be stripped from the two excess material storage areas and arranged in a series of berms that serve as stormwater catchments. The existing wetlands area shown in pale blue on Figure 3 would be protected from any surface disturbance by implementing COAs attached to APDs for the oil and gas wells (see the Appendix) and best management practices.

A closed-loop drilling system would be used, eliminating the need for a fluids-containing reserve pit. Recovered drilling fluid would be stored on location in steel tanks for reuse. Water-based drill cuttings would be collected from the rig's shaker system and would be placed in the cuttings management area with a constructed perimeter berm along the cutslope side of the pad. After the drilling is finished, the cuttings would be tested to ensure compliance with COGCC standards, would be blended with the excess material against the west-side cutslope, and would be buried during the earthwork stage of interim

reclamation. Should a synthetic-based mud be used for drilling the three horizontal wells, prior sundry approval would be required with consideration that cuttings would be hauled to an approved disposal site. The drilling plan includes the use of a self-contained flare unit to restrict venting.

The reconstructed, expanded MV 34-5 pad would involve 3.63 acres of initial surface disturbance and create 1.44 acres of long-term disturbance (Table 1). The initial surface disturbance for the stockpiled dirt would be 2.08 acres with a minimal (0.08 acres) long-term disturbance attributed to perimeter areas along the new access road. The proposed Ant Hill Road Improvements including the segments in the vicinity of the MV 34-5 pad would result in 4.01 acres of initial disturbance and yield 1.81 acres of long-term disturbance accounting for the roadway and ditches. The new pipeline disturbances would be included in the road figures. Since the welded steel frac lines would be cabled and pulled cross-country or laid along existing roads, there is no specific disturbance allowance.

Total disturbance estimates for the project involve 9.72 acres of initial surface impacts and 3.25 acres of long-term effects for the 30-year life of the project (Table 1).

Table 1. Surface Disturbance for MV 34-5 Project

	Private		***BLM***		***Totals***	
New Disturbance	***Initial***	***Long-Term***	***Initial***	***Long-Term***	***Initial***	***Total Long-Term***
MV 34-5 Pad	0.00	0.00	0.94	0.02	0.94	0.02
MV 34-5 Pad Stockpiles	0.00	0.00	2.06	0.06	2.06	0.06
MV 34-5/Ant Hill Road	0.00	0.00	3.11	1.22	3.11	1.22
Subtotal	**0.00**	**0.00**	**6.11**	**1.30**	**6.11**	**1.30**
Existing Disturbance	***Initial***	***Long-Term***	***Initial***	***Long-Term***	***Initial***	***Total Long-Term***
MV 34-5 Pad	0.00	0.00	0.58	0.55	0.58	0.55
MV 34-5 Pad Stockpiles	0.00	0.00	0.02	0.02	0.02	0.02
MV 34-5/Ant Hill Road	0.00	0.00	0.85	0.55	0.85	0.55
Subtotal	**0.00**	**0.00**	**1.45**	**1.12**	**1.45**	**1.12**
Redisturbance	***Initial***	***Long-Term***	***Initial***	***Long-Term***	***Initial***	***Total Long-Term***
MV 34-5 Pad	0.00	0.00	2.11	0.79	2.11	0.79
MV 34-5/Ant Hill Road	0.00	0.00	0.05	0.04	0.05	0.04
Subtotal	**0.00**	**0.00**	**2.16**	**0.83**	**2.16**	**0.83**
TOTAL DISTURBANCE	**0.00**	**0.00**	**9.72**	**3.25**	**9.72**	**3.25**

The MV 34-5 project would include the following components:

(1) Redisturbing and expanding the existing MV 34-5 pad to a 3.63-acre disturbance footprint to provide working space for drilling, completion and well production operations and to provide storage space for drill cuttings.

(2) Creating two storage areas for excess material generated from the pad reconstruction disturbing 2.08 acres.

(3) Constructing 4,555 feet of new road as part of the Ant Hill Road Improvement work disturbing 4.01 acres.

(4) Completing final reclamation work on 1.56 acres of road removed from service as result of the Ant Hill Road Improvements

(5) Restricting access to pickup trucks on the two road segments that would remain in service to maintain and operate the two gas valve risers resulting in 0.44 acres of existing disturbance.

(6) Drilling nine Federal wells directionally in Spring 2015 and then drilling three Federal wells horizontally with a followup drilling visit in Summer-Fall 2015 into the underlying Federal lease.

(7) Conducting "simops" well completion operations on the existing Riley Gulch Frac Pad during the drilling process and laying 9,512 feet of surface frac lines between the two pads for water delivery and flowback for both drilling visits.

(8) Storing cuttings on location in the cuttings management area for the initial 9 directional wells while any of the cuttings generated with the use of synthetic-based mud for the three Niobrara wells would require sundry approval and be hauled to an approved disposal facility.

(9) Burying a new 10-inch welded steel gas pipeline and 4-inch Flexsteel produced water line within the new road corridor for approximately 525 feet.

(10) Reclaiming (interim) the MV 34-5 pad to a working area footprint of 1.44 acres and establishing desirable vegetation cover on the reshaped pad.

(11) Amending the existing BLM road ROW issued to Caerus to reflect the changes made in the Ant Hill Road Improvements.

The Proposed Action would include well drilling and well completion, production of natural gas and associated liquid condensate, proper handling and disposal of produced water, and interim and final reclamation.

Construction of the pad and pipeline spur would follow the guidelines established in the BLM Gold Book, *Surface Operating Standards for Oil and Gas Exploration and Development* (USDI and USDA 2007). The new and existing pad access roads would be graveled to ensure all-weather accessibility to the pad site. A road maintenance program would be required during the production phase of the well. This program would include, but not be 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 be implemented consistent with the Federal oil and gas lease, Federal regulations (43 CFR 3100), and the operational measures included in the Applications for Permit to Drill (APDs) for the Federal wells. The Appendix lists the specific Surface Use Conditions of Approval (COAs) to 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.

A biological survey was conducted in May 2013 with a June 2013 addendum for the MV 34-5 project (WWE 2013a). An additional Riley Gulch Ute Ladies'-tresses Survey Report was written in August 2013 indicating most wetland/riparian habitat observed in the Riley Gulch drainage is unsuitable for the plant (WWE 2013b). A final field review in October 2014 by the BLM botanist determined that adequate plant surveys were documented for this project.

NO ACTION ALTERNATIVE

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements, the final reclamation of the old steep road grades, or the final reclamation work at the Riley Gulch pipeline crossing would not be implemented. No new surface disturbances on BLM land would be necessary. However, the five operating Federal wells would continue to be produced. Future levels of activity at the pad would be the same as are at present.

PURPOSE AND NEED FOR THE ACTION

The purpose of the Proposed Action is to develop oil and gas resources on Federal Lease COC24603 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

The directional and horizontal wells would be drilled from the MV 34-5 pad on BLM land into the underlying Federal lease COC24603 which does not include a big game winter timing limitation. Therefore, a 60-day Condition of Approval, allowed under Federal regulation 43 CFR 3101.1-2, would be included on the Application for Permit to Drill (APD) restricting any construction, drilling or completion work from January 1 through March 1.

Table 2 lists the applicable stipulations shown on Federal oil and gas lease COC24603. The Appendix lists site-specific conditions of approval (COAs) developed during the APD/EA review and onsite field consultation that would be attached to the Federal APDs.

Table 2. COC24603 Lease Stipulation

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

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 1999b).

Decision Language: The 1991 Oil and Gas Plan Amendment (BLM 1991) included the following at page 3: "697,720 acres of BLM-administered mineral estate within the Glenwood Springs Resource Area are open to oil and gas leasing and development, subject to lease terms and (as applicable) lease stipulations" (BLM 1991, page 3). This decision was carried forward unchanged in the 1999 ROD and RMP amendment at page 15 (BLM 1999b): "In areas being actively developed, the operator must submit a Geographic Area Proposal (GAP) [currently referred to as a Master Development Plan, MDP] that describes a minimum of 2 to 3 years of activity for operator controlled leases within a reasonable geographic area."

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

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

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

Access and Transportation

Affected Environment

The project area is accessible from Parachute, Colorado, by traveling northwest on CR 215 for approximately 2 miles and then another 3.1 miles on a private field development road along the west-side of Parachute Creek and up Riley Gulch to the existing MV 34-5 pad. Since the access road crosses private land, no public access to the MV 34-5 pad is available.

The project area would be accessed by vehicles serving the oil and gas development, including traffic related to construction, drilling, completion, and well production. Minor additional vehicle numbers would be attributed to livestock grazing operations during the summer-fall grazing season.

The existing road and the new 0.86-mile road realignment accessing the project area would serve the transportation needs of the Proposed Action. Some road resurfacing would be needed depending on the scheduled drilling season. The Proposed Action would result in a substantial increase in truck traffic related to the development of the proposed Federal wells. The largest traffic increase would be during

rig-up, drilling, and completion activities. The MV 34-5 project involves drilling of both horizontal and directional wells which have differing transportation impacts.

The drilling of a typical directional well would involve approximately 1,160 truck trips over a 30-day period covering the time period to drill and complete the well (Table 3). Traffic would dramatically decrease over time to occasional visits in pickups for monitoring or maintenance activities. Produced water generated during the life of the well would be transferred via the buried Riley Gulch collection line to the Riley Gulch Tank Facility and ultimately transferred to the Parachute Water Treatment Facility via buried pipeline. The volume of condensate collected on the pad would require periodic truck visits to remove the oil from the tanks. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days.

Table 3. Traffic Associated with Directional Drilling and Completion

Vehicle Class	*Trips per Well*	*Percent of Total*
18-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.

Traffic associated with drilling and completing horizontal wells can increase dramatically compared to directional wells, with drilling averaging around 2 months and completions requiring an additional month. As shown in Table 4, data for traffic supporting drilling and completion operations have been modified by a factor of three when compared to a typical directional well to reflect the extended time it takes to drill an exploratory horizontal well. Thus, the overall traffic count for the new horizontal well would be estimated at 3,480 vehicles instead of the 1,160 vehicles typically associated with the drilling and completion of a directional well.

Table 4. Traffic Associated with Horizontal Drilling and Completion

Vehicle Class	*Trips per Well*	*Percent of Total*
18-wheel tractor trailers	264	7.6
10-wheel trucks	648	18.6
6-wheel trucks	1,356	39.0
Pickup trucks	1,212	34.8
Total	**3,480**	**100.0**

Initial source for traffic associated with directional well drilling and completion operations: BLM 2006. Note: With the exploratory nature of drilling and completing horizontal wells, accurate traffic analysis has not yet been developed. To better reflect the traffic supporting the longer wellbores and operational drilling and completion periods for such wells, the typical traffic counts associated with a directional well have been increased by a factor of 3 from the numbers displayed in Table 3).

Traffic numbers related to a producing horizontal well are similar to those of a producing directional well. Traffic would dramatically decrease over time to occasional visits in pickups for monitoring or maintenance activities. Produced water generated during the life of the well would be transferred via the buried Riley Gulch collection line to the Riley Gulch Tank Facility and ultimately transferred to the Parachute Water Treatment Facility via buried pipeline. The volume of condensate collected on the pad would require periodic truck visits to remove the oil from the tanks. Each well may have to be recompleted once per year, requiring three to five truck trips per day for approximately 7 days.

The Ant Hill Road Improvements would entail 4,555 feet of new road segments and 2,550 feet of existing road segments that would be taken out of service and reclaimed back to natural contour. Details of the road construction plans are presented in the Proposed Action.

The average road grade would be 10% or less, except for certain short pitches with a proposed 13% grade. This is a drastic reduction in road grade since the existing Ant Hill road approaches 20% pitches. Minimum horizontal curve radii would be 100 feet. Where terrain would not allow a 100-foot curve radius, the curve would be widened. Road construction would result in approximately 4.01 acres of short-term surface disturbance. Following interim reclamation, the long-term surface disturbance associated with roads would be approximately 1.81 acres (Table 1).

Proposed roads would be constructed within an average disturbance corridor 40 feet wide, reduced to 24 feet of finished road surface (including bar ditches) after interim reclamation. A conventional dozer would be used to clear vegetation and large boulders within the proposed limits of disturbance for the planned roads. Earth-moving equipment would be used to segregate and windrow the topsoil along the edge of the proposed road corridor. The roads would be constructed using standard equipment and techniques as described in the *Surface Operating Standards for Oil and Gas Exploration & Development* – The Gold Book (USDI and USDA 2007). Mitigation measures (Appendix) would be required as conditions of approval for road construction and maintenance operations including, but not limited to dust abatement, ditching, draining, crowning, surfacing, sloping, and dipping the roadbed as necessary. A minimum 6-inch layer of gravel would be applied to the Riley Gulch Roads to provide an all-weather travelway.

Degradation of field development roads may occur due to heavy equipment travel. Fugitive dust and noise would be created (as later evaluated under the "Noise" analysis). Mitigation measures (Appendix) would be required to ensure adequate dust abatement and road maintenance on the access roads.

No Action

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present.

Without implementation of the Ant Hill Road Improvements and its related road reclamation work, the excessively steep access road would continue to be used by heavy trucks. Thus, vehicle use would continue to damage the roadway, heavy truck travel during rig moves would continue to require a dozer to pull vehicles up the steep road pitches, and the risk of an accident or spill due to these road conditions would continue.

Air Quality

Affected Environment

Colorado Ambient Air Quality Standards (CAAQS) and National Ambient Air Quality Standards (NAAQS) are health-based criteria for the maximum acceptable concentrations of air pollutants in areas of public use. Although specific air quality monitoring has not been conducted within the project area, regional air quality monitoring has been conducted in Rifle and elsewhere in Garfield County. Air pollutants measured in the region for which ambient air quality standards exist include carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), particulate matter less than 10 micrometers (µm) in diameter (PM_{10}), and particulate matter less than 2.5 µm 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) CAAQS and/or NAAQS standards. Regional background values are well below established standards, and all areas within the cumulative study area are designated as attainment for all criteria pollutants. The Garfield County Quarterly Monitoring Report summarizing data collected at monitoring sites in Parachute, Silt, Battlement Mesa, and Rifle in January through June 2012 (the most recent posting) confirms continuing attainment of the CAAQS and NAAQS (Garfield County 2012). Federal air quality regulations are enforced by the Colorado Department of Public Health and Environment (CDPHE) under its delegated authority from the U.S. Environmental Protection Agency (EPA) pursuant to the Clean Air Act (CAA).

Federal air quality regulations under the 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 70 air-miles to the northwest. PSD Class I areas located within 100 miles of the project area are the Flat Tops Wilderness (approximately 40 air-miles northeast), Maroon Bells – Snowmass Wilderness (approximately 50 air-miles east-southeast), West Elk Wilderness (approximately 60 air-miles southeast), Black Canyon of the Gunnison National Park (approximately 60 air-miles south), and Eagles Nest Wilderness (approximately 90 air-miles east-northeast).

Environmental Consequences

Proposed Action

The EPA delegated the CDPHE to implement the CAA within Colorado. In conformance with Colorado's State Implementation Plan (SIP), the CDPHE 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.

To provide a safe operating space to drill, complete, and operate the 12 new Federal wells and to continue to produce the 5 existing Federal wells, the Proposed Action includes the expansion of the existing MV 34-5 pad generally within its pre-existing footprint resulting in 3.63 acres of initial disturbance. New stockpile areas to store excess material from the pad expansion, comprising 2.06 acres, would be created

south of the pad, resulting in an overall initial stockpile disturbance area of 2.08 acres. Thus, the pad expansion work would create 5.71 acres of initial surface disturbance with 1.44 acres of long-term disturbance across the life of the producing wells.

The proposed Ant Hill Road Improvements including the segments in the vicinity of the MV 34-5 pad would result in 4.01 acres of initial disturbance and yield 1.81 acres of long-term disturbance accounting for the roadway and ditches. The new pipeline disturbances would be included in the road figures. Since the welded steel frac lines would be cabled and pulled cross-country or laid along existing roads, there is no specific disturbance allowance. The total short-term disturbance (9.72 acres) for the project would occur on BLM land with a corresponding long-term surface impact of 3.25 acres (Table 1).

The horizontal well would require approximately 60 days to drill and 30 days to complete. The directional well generally takes 10 days to drill and another 20 days for well completion. Air quality in the project area would decrease during construction of access roads, pads, and pipelines, during well drilling and completion, and throughout the development of the project. The road improvements for this project would benefit long-term air quality by decreasing long-term dust generation. In addition, the centralized fluids collection facilities would reduce truck traffic and fugitive emissions.

Pollutants generated during construction activities would include combustion emissions and fugitive dust (PM_{10} and $PM_{2.5}$) associated with earthwork and construction equipment. Once construction activities were 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 the 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 the 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 the 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 the 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 1 deciview or greater) in the Flat Tops Wilderness and no days with 1 deciview or greater reduction in visibility at all other modeled Class I and II receptors. For the remaining pollutants analyzed, modeled levels of future oil and gas development within the CRVFO would have no or negligible long-term adverse impacts on air quality. Since the Proposed Action is within the scope of the future development modeled, no significant adverse impacts on air quality are anticipated.

The air quality model incorporated assumptions about various development and mitigation scenarios either integrated into WPX's project design or to be applied by the BLM as COAs (Appendix). 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). 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 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).

There are uncertainties associated with the science of climate change, but this does not imply that scientists do not have confidence in many aspects of climate change science. According to the EPA, some aspects of the science are "known with virtual certainty because they are based on well-known physical laws and documented trends" (USEPA 2010).

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, the annual GHG emissions from Federal wells would be 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 (USEPA 2010).

While the CRVFO has historically relied on RMP-level air quality modeling as a basis for predicting air impacts from different levels and rates of oil and gas development, BLM Colorado will soon implement an adaptive management approach based on its newly developed Comprehensive Air Resources Protection Protocol (CARPP). WPX and other operators will be required to provide project-specific emissions inventories for air pollutants. The BLM will use these inventories, in conjunction with the Colorado Air Resources Management Modeling Study (CARMMS) and periodically updated air quality monitoring data, to assess potential impacts on air quality and, if necessary, to implement additional measures for reducing impacts from oil and gas operations and for ensuring that air quality standards are met.

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to those of the present. The proposed Ant Hill Road Improvements and centralized fluids collection facilities, which would decrease long-term fugitive dust, would not be implemented. Since no new surface disturbance or additional wells are associated with this alternative, only the existing direct or indirect adverse impacts to air quality are anticipated.

Cultural Resources

Affected Environment

Seven (Class III) cultural resource inventories (CRVFO# 1164, 1199-2, 1104-1, 1107-33, 1112-15, 1114-4, and 1114-11) have been conducted within the area of the Proposed Action for the MV 34-5 Pad Expansion and Ant Hill Road Improvements, three of which were completed recently by Grand River Institute of Grand Junction specifically for this project. The seven inventories have identified one eligible site within the project's area of potential effect.

Monitoring near this site (5GF1185) for a waterline replacement project and frac pad construction project in mid-2014 identified a number of cultural features that have be now included in an expanded and redefined site boundary. Adverse effects to the previously mentioned features were mitigated through data recovery and feature protection.

No new ground disturbance is planned within the 5GF1185 boundary, although a surface "frac" line would cross a previously disturbed portion of the site. Therefore, one "historic property" has been identified as being within the area of the current Proposed Action. "Historic properties" are cultural resources that are eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP). Isolated finds are by definition not eligible to the NRHP.

Environmental Consequences

Proposed Action

Implementation of the Proposed Action would have no direct impacts to known "historic properties," identified in the project's area of potential effect. Consequently, 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 (NHPA 16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement (1997) and Colorado Protocol (1998)]. Cultural resource types typically found in the surrounding areas include prehistoric open camps, lithic scatters, historic ditches, historic structures, historic trash scatters/dumps and isolated prehistoric and historic finds.

Although no effects are anticipated to site 5GF1185 within the areas of potential effect, indirect, long-term cumulative impacts from increased access and the presence of project personnel could result in a range of impacts to known and undiscovered cultural resources in the vicinity of the project location. These impacts could range from accidental damage or vandalism to illegal collection and excavation.

A Standard Education/Discovery COA for cultural resource protection would be attached to the APDs as a COA (Appendix). The importance of these COAs would be stressed to the operator and their 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 MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to present conditions. Because no new surface disturbance or additional wells are associated with this alternative, no new direct or indirect impacts to cultural resources are anticipated. However, existing indirect impacts and cumulative impacts would continue.

Fossil Resources

Affected Environment

The predominant bedrock formations present at or near the surface within the project area are the Wasatch Formation (including the Fort Union Formation at its base) and the Ohio Creek Formation, and Anvil Points, Garden Gulch and Parachute Creek members of the Green River Formation. Both formations are

overlain by areas of Quaternary gravels and earthflow deposits. 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.

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

All members of the Wasatch Formation contain vertebrate fossils in varying abundances (Murphy and Daitch 2007). Rocks of the Wasatch Formation are lithologically 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).

The Green River Formation consists of fine-grained lacustrine and fluvial-lacustrine rocks that were deposited in the Eocene Lake Uinta. The lake expanded early in its history, during the Long Point transgression (Johnson 1985), to cover much of the Piceance and Uinta Basins. The Green River Formation has yielded hundreds of invertebrate and plant fossils and more than 60 vertebrate taxa have been described from the formation, including crocodiles, boa constrictors, and birds.

Environmental Consequences

Proposed Action

Although mapped as the predominant surface formation of the project area, field inspection did not revealed any Wasatch outcrops in the project area. 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 there are two known fossil discovery sites (in Section 8, T7S R86W) within a 1-mile radius of the project area. Paleontology surveys of the MV 34-5 location conducted in 2004 revealed no findings. Areas covered with vegetation and soil cover do not usually yield fossil resources, but inspections should be conducted for proposed facilities that are located on or within 200 feet of Wasatch or Green River Formation bedrock surface exposures. In the event paleontological resources are encountered, BMPs related to the standard paleontological COA would be recommended (Appendix).

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to present conditions. Because no new surface disturbance or additional wells are associated with this alternative, no new direct or indirect impacts to fossil resources are anticipated. However, existing impact types and levels would continue.

Geology and Minerals

Affected Environment

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

Table 5. Geologic Formations within the Project Area

Map Symbol	***Formation Name***	***Age***	***Characteristics***	***Location***
Qa	Alluvial and Floodplain Deposits	Holocene	Mud, silt, sand and gravel.	Mantels topography.
Qp	Pediment Deposits	Pleistocene	Sand and gravel	Fans and slump blocks
Tgg	Green River Formation – Garden Gulch Member.	Eocene	Dark brown and gray flaky shale. Brown sandstone and limestone.	Slopes and outcrops.
Tgd	Green River Formation – Douglas Creek member.	Eocene	Gray brown sandstone, siltstone and limestone.	Steep slopes and outcrops.
Tgg	Green River Formation – Anvil Points member.	Eocene	Gray brown sandstone, siltstone and limestone and gray green shale.	Steep slopes and outcrops.
Two	Wasatch and Ohio Creek Formations	Paleocene	Red, gray and brown sandstone and siltstone and red, green and gray shale.	Steep slopes and outcrops.

Source: Donnell et al. 1989

The predominant bedrock exposures within the proposed development area are the Tertiary Green River and Wasatch Formations. The Green River formation is composed of alternating layers of fine grained sandstones and laminated to massive marlstone. The Green River Formation overlies the Wasatch Formation, which 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. Production of natural gas and associated liquid condensate is derived from three reservoir intervals in the Wasatch, Williams Fork, and Iles Formations. The latter two make up the Upper Cretaceous Mesaverde Group.

The Iles Formation of the Mesaverde Group is the target zone of the proposed directional 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. The proposed directional 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 (lake), and palustrine (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 Niobrara Formation is the target zone of the proposed horizontal drilling program. The Niobrara Formation underlies components of the Mesaverde Group and is interfingered with the Mancos Shale. The Mancos Shale is the source for gas that has migrated into the reservoirs in the lower part of the Mesaverde Group as well as the Dakota Sandstone, Corcoran, Cozzette, and Rollins Sandstone Members. These formations are the source of much of the local gas production. The Mancos Shale is a ubiquitous formation of similar age as other regional known shale gas resource plays (BLM 2012). Peak gas generation from coals and carbonaceous rocks occurred about 47 million years ago (Johnson and Roberts, 2002).

Sediments of the Niobrara Formation are predominately marine shales, with minor amounts of sandstones, siltstones, and limestones (Finn and Johnson 2005). These sediments were deposited during the Cretaceous period when rising sea levels created the Western Interior Seaway. Sediments were deposited along the margins of the Interior Seaway in swamps and marshes associated with a deltaic and coastal plain environment.

The depth of the Mancos/Mowry section that contains the Niobrara Formation is over 4000 feet thick in some areas, and source rocks include coal beds and organic-rich carbonaceous shale rocks of the Upper Cretaceous Mesaverde Group, Mancos Formation, and Lower Cretaceous Mowry Formation (BLM 2012). Gas expelled from coals and carbonaceous shale rocks is interpreted as having migrated into nearby low-permeability sandstone beds of the Mesaverde Group, initiating basin-centered gas accumulations (Johnson and Roberts, 2002). The trapping mechanism of the gas is both stratigraphic (related to lithology) and diagenetic (related to post-depositional process).

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. Potential impacts of hydraulic fracturing are addressed in the section on Water Resources.

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to present conditions. Because no new surface disturbance or additional wells are associated with this alternative, no new direct or indirect impacts to geology resources are anticipated. However, existing impact types and levels would continue.

Invasive Nonnative Plants

Affected Environment

State-listed noxious weeds are designated by the Colorado Department of Agriculture. Management of these weeds is regulated under the Colorado Noxious Weed Act, Title 35, Article 5.5. Botanical surveys conducted in May 2013 and October 2014 identified state-listed noxious weeds occurring within the MV 34-5 Pad Expansion and Ant Hill Road Improvements project area, as well as other nonnative plant species which can also have detrimental impacts on native plant communities (WWE 2013a, WWE 2013b, Perkins field notes). The proposed projects would occur in the vicinity of existing well pads, pipelines, and access roads on BLM lands. In association with these previous disturbances, noxious weeds and other nonnative plant species have established.

Four State B List noxious weed species were identified within the project area: bull thistle (*Cirsium vulgare*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), and tamarisk (*Tamarix ramosissima*). These are in addition to five State C List noxious weed species: cheatgrass (*Bromus tectorum*), common burdock (*Arctium minus*), common mullein (*Verbascum thapsus*), field bindweed (*Convolvulus arvensis*), and redstem filaree (*Erodium cicutarium*). Tamarisk is concentrated in a small wetland area south of the MV 34-5 pad (Figure 3) and in riparian areas along Riley Gulch. Houndstongue is also common in these areas and in degraded areas along the proposed road realignment. The other noxious weed species are scattered primarily along Riley Gulch and in previously disturbed areas. Cheatgrass is present but uncommon.

In addition to these noxious weeds are several other non-native species that can negatively impact native plant communities. These include bur buttercup (*Ceratocephala testiculata*), field brome (*Bromus arvensis*), kochia (*Bassia scoparia*), salsify (*Tragopogon dubius*), and white horehound (*Marrubium vulgare*). Three non-native species are also present in association with older reclamation seedings, crested wheatgrass (*Agropyron cristatum*), smooth brome (*Bromus inermis*), and yellow sweetclover (*Melilotus officinalis*). Redtop grass (*Agrostis stolonifera*), a non-native species historically seeded in wet

meadows and riparian areas, is also present in moister portions of the project area. All of these species have the potential to become invasive, particularly in disturbed areas.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 9.72 acres would be disturbed including 6.11 acres of new disturbance, 1.45 acres of existing disturbance and 2.16 acres of previously disturbed areas. Following construction and well completions, interim reclamation would occur on all areas not needed for ongoing operations. A total of 3.25 acres would remain as long-term disturbance. Interim reclamation would consist of seeding with native plant species in accordance with the reclamation COAs presented in the Appendix. All of the disturbance would occur on BLM land.

Surface-disturbing activities, such as those proposed for this project, provide a niche for invasion and establishment of nonnative plant species particularly when these species are already present in the surrounding area. The mechanisms for this invasion and establishment are multi-fold. Removal of native vegetation removes the competition from native plants for resources, including water and soil nutrients, opening up niches for invasive species (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, as well as new road construction and installation of pipelines, 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 are difficult to eliminate.

The project area has a history of extensive disturbance associated with oil and gas development, as well as a history of livestock grazing. As a result, noxious weed occurrences are concentrated primarily near existing disturbance areas, although those species which readily attach to the hair of livestock, such as houndstongue and cheatgrass, are more widely scattered. With new project disturbances, the potential for increased establishment of noxious weeds and other undesirable plants following construction activities is high. Movement of soil by construction equipment could be expected to spread weed seeds throughout the project area, and the total area of disturbed habitat would increase. 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 the invasive species risk, treatment of existing noxious weed infestations would be required prior to starting construction, and 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). Establishment of native plant species is also crucial in preventing invasive nonnative plant species establishment and spread. Therefore, the standard reclamation COAs would also be attached to

APDs to require seeding with an appropriate native seed mix and monitoring of reclamation seeding results (Appendix).

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present.

Because there would be no new surface disturbance, there would be no disturbed habitat created for noxious weeds and invasive species. Because the existing wells would remain in production, the potential for introduction of noxious weed and invasive species to the site on vehicles would remain and existing noxious weed and invasive species concerns would be expected to continue.

Native American Religious Concerns

Affected Environment

The proposed MV 34-5 Pad Expansion and Ant Hill Road Improvements project is located within a larger area identified by the Ute Tribes as part of their ancestral homeland. Cultural resource inventories (see section on Cultural Resources) were conducted to determine if there were any areas that might be culturally sensitive to Native Americans. A small number of cultural resources were identified during the inventories, though only one is located in the areas of potential effect within proposed project area.

Environmental Consequences

Proposed Action

Cultural resource inventories (see the section on Cultural Resources) were conducted to determine if there were any areas that might be culturally sensitive to Native Americans. At present, Site 5GF1185 is the only cultural resource of Native American concern known within the project area. The MV 34-5 Pad Expansion and Ant Hill Road Improvements are located within a larger area identified by the Ute Tribes as part of their ancestral homeland. The Ute Tribe of the Uintah and Ouray Bands, the Southern Ute Tribe, and Ute Mountain Ute Tribe were notified on June 25th, 2014 of the discovery during project monitoring of additional buried features most likely associated with the nearby and previously recorded 5GF1185. No responses, questions, or requests for additional information have been received as of this date. Additionally, on October 17, 2014, Betsy Chapoose, NAGPRA Representative with the Ute Indian Tribe's Cultural Rights and Protection Office was given a tour of the site location and a small portion of project area. Her only request was to be informed of any additional excavation at site 5GF1185.

If new data 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 at the site could indirectly impact previously unidentified Native American resources ranging from illegal collection to vandalism.

The NHPA requires that if newly discovered cultural resources are identified during project implementation, work in that area must stop and the agency Authorized Officer notified immediately (36

CFR 800.13). The Native American Graves Protection and Repatriation Act (NAGPRA), requires that if inadvertent discovery of Native American Remains or Objects occurs, activity must cease in the area of discovery, a reasonable effort made to protect the item(s) discovered, and immediate notice made to the agency Authorized Officer, as well as the appropriate Native American group(s) (IV.C.2). Notice may be followed by a 30-day delay (NAGPRA Section 3(d)).

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

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to present conditions. Because no new surface disturbance or additional wells are associated with this alternative, no new direct or indirect impacts to cultural resources are anticipated. However, existing indirect impacts and cumulative impacts could still continue.

Noise

Affected Environment

The project area is rural, and noise levels are presently created by traffic on nearby roads conducting oil and gas development activities. There are no residences located in the Riley Gulch area.

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 on 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 would be 60 dBA during a normal conversation between two people standing five feet apart.

Environmental Consequences

Proposed Action

The project would result in increased levels of noise during the construction, drilling, and completion phases. The noise would be most noticeable along the roads used to haul equipment and at the pad location. Drilling activities are subject to noise abatement procedures as defined in the COGCC Rules and Regulations (Aesthetic & Noise Control Regulations). Operations involving pipeline or gas facility installation or maintenance, compressors, the use of a drilling rig, completion rig, workover rig, or

hydraulic 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 6) at a distance of 350 feet. Given the remote locations of the proposed project activities, with no reasonably close occupied structure or designated recreational area, the light industrial standard is applicable. The allowable noise level for periodic impulsive or shrill noises is reduced by 5 dBA from the levels shown (COGCC 2008).

Table 6. 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

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

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.

Table 7. 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)

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to those of the present. Since no new surface disturbance or additional wells are associated with this alternative, only the existing direct or indirect noise impacts are anticipated.

Realty Authorizations

Affected Environment

Three existing BLM rights-of-way (ROWs) traverse the project area. These are as follows.

COC40276 is a ROW for a natural gas gathering pipeline, issued to WPX in 1986. WPX intends to replace this 4-inch line with a new 6-inch line as part of the MV 34-5 pipeline upgrades.

COC67026 was issued to Petroleum Development Corporation ("PDC") in 2003 for use of an existing road that also provides access to fee wells south of the MV 34-5 pad in Riley Gulch. With the planned road improvements associated with the Ant Hill Road Work, this ROW would be amended and transferred to Caerus (operator who recently acquired PDC holdings).

COC67522 is for a 4-inch-diameter natural gas pipeline, issued to PDC in 1986 (CO-140-2004-0053-CX). The pipeline was constructed within the existing access road (COC67026). The pipeline transports natural gas from a PDC well on Fee land (private surface/private minerals). The ROW would be transferred from PDC to Caerus to reflect the recent change of operator.

Environmental Consequences

Proposed Action

WPX would work with Caerus to amend their ROW COC67026 for the proposed road realignment related to the Ant Hill Road Work. Upon approval of this EA and WPX APDs, an SF299 would be submitted to the BLM and an amended ROW grant would be issued to Caerus to reflect the road changes.

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary.

ROW COC67026 would not be amended and an amended ROW grant would not be issued. However, the five existing Federal wells would continue to be produced. Since no new surface disturbance or additional wells are associated with this alternative, no new impacts to realty authorizations are anticipated.

Socioeconomics

Affected Environment

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

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

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

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

Table 8. Selected Industry Sectors for Garfield County

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

The communities of Parachute, Rifle, Silt, and New Castle are considered to have the most affordable housing, while the communities of Glenwood Springs and Carbondale have the least affordable housing. In March 2012 the cost of living index in Garfield County was 88.6, below the U.S. average of 100 (City Data 2012). Activities on public land in the vicinity of the project area are primarily ranching/farming, hunting, OHV travel, and the development of oil and gas resources. Hunters contribute to the economy

because many require lodging, restaurants, sporting goods, guides and outfitting services, food, fuel, and other associated supplies.

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

Property tax revenue from oil and gas development is a source of public revenue in Garfield County. In 2012, oil and gas assessed valuation in Garfield County was approximately $2.8 billion, or about 73% of total property tax assessed value distribution (Garfield County 2013b). The county's largest taxpayers are in the oil and gas industry (Garfield County 2013c). The Federal government makes Payments in Lieu of Taxes (PILT) to local governments to help offset losses in property taxes due to nontaxable Federal lands within their boundaries (USDI NBC 2013). The PILT distributions are based on acres for all Federal land management agencies. Approximately 60% of all Garfield County lands are Federally owned (Garfield County 2013a). The amount may also be adjusted based on population and as apportioned by Congress. By formula, payments are decreased as other Federal funds, such as mineral royalty payments, increase. PILT amounts to Garfield County over the last five years ranged from $1,732, 974 in 2008 to $403,176 in 2012 (USDI NBC 2013).

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

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

Environmental Consequences

Proposed Action

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five existing wells would continue to be produced, resulting in socioeconomic impacts similar to those of the present.

Soils

Affected Environment

According to the *Soil Survey of Rifle Area, Colorado* (USDA 1985), 95% of the MV 34-5 project surface disturbance (including the pad expansion, nearby excess material stockpiles and road realignment), closure and reclamation work would occur within the Torriorthents-Camborthids-Rock Outcrop Complex (Table 9). Primary uses for these soils are grazing, wildlife habitat, and recreation.

Table 9. Soil Descriptions for the Flatiron Mesa Phase 2 Development Area

Mapping Unit Name	*Description*	*Erosion Hazard*	*Permeability*	*Proposed Infrastructure Type*
Torriorthents-Camborthids-Rock Outcrop Complex 15-70% slope	Exposed sandstone and shale bedrock and shallow to moderately deep soils formed over alluvium on foothills and mountainsides. Stony clay to stony loam, covered with stones weathered from outcrops.	Moderate to Severe	N/A	95% of the MV 34-5 project disturbance including Ant Hill Road Work
Rock Outcrop-Torriorthents Complex 50-80% slope	Exposed bedrock, loose stones, shallow soils over bedrock, and stony basaltic alluvium. These soils and rock outcrops are moderately steep to very steep.	Moderate to Severe	N/A	Very north edge of the existing MV 34-5 Pad

Environmental Consequences

Proposed Action

To provide a safe operating space to drill, complete, and operate the 12 new Federal wells and to continue to produce the 5 existing Federal wells, the Proposed Action includes the expansion of the existing MV 34-5 pad generally within its pre-existing footprint resulting in 3.63 acres of initial disturbance. New stockpile areas to store excess material from the pad expansion, comprising 2.06 acres, would be created south of the pad, resulting in an overall initial stockpile disturbance area of 2.08 acres. Thus, the pad expansion work would create 5.71 acres of initial surface disturbance with 1.44 acres of long-term disturbance across the life of the producing wells.

The proposed Ant Hill Road Improvements including the segments in the vicinity of the MV 34-5 pad would result in 4.01 acres of initial disturbance and yield 1.81 acres of long-term disturbance accounting for the roadway and ditches. The new pipeline disturbances would be included in the road figures. Since the welded steel frac lines would be cabled and pulled cross-country or laid along existing roads, there is

no specific disturbance allowance. The total short-term disturbance (9.72 acres) for the project would occur on BLM land with a corresponding long-term surface impact of 3.25 acres (Table 1).

The MV 34-5 pad expansion contains adequate vegetation buffers and relatively moderate (20% to 35%) slopes that would minimize the potential for sediment transport to nearby Riley Gulch and the Colorado River. However, construction activities would cause slight increases in local soil loss, loss of soil productivity, and sediment available for transport to surface waters. Potential for such soil loss and transport increases as a function of slope, feature (pad, road, or pipeline route) to be constructed, and proximity to streams and drainages. The implementation of COAs (Appendix) would reduce the risk of erosion and loss of soil productivity through soil stabilization and temporary reclamation.

All of the area to be disturbed consists of soils with a moderate to severe risk of erosion or slope instability. The new pad construction is designed and positioned in an optimal topographic location to avoid disturbances to drainages and steep slopes. All road sections would be maintained and graveled as needed. The various segments of road to be removed from service would be recontoured, seeded and reclaimed to control erosion and to support other land uses. Care has been taken in project planning to avoid existing, active slump areas and minimize disturbances on steep slopes. Particular care should be taken to ensure that proper BMPs, including the COAs listed in the Appendix are utilized to prevent erosion and slope instability due to construction activities.

No Action

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced. Future levels of activity at the pad and impacts to soil resources would be the same as at present.

The proposed Ant Hill Road Improvements, which would likely decrease erosion and sedimentation, would not be implemented. Without the implementation of the Ant Hill Road Improvements and its related road reclamation work, the excessively steep access road would continue to be used by heavy trucks. Thus, vehicles would continue to damage the roadway, heavy truck travel during rig moves would continue to require a dozer to pull vehicles up the steep road pitches, and the risk of an accident or spill due to these road conditions would continue.

Special Status Species

Federally Listed, Proposed, or Candidate Plant Species

Affected Environment

According to the latest species list from the USFWS, four Federally listed plant species may occur within or be impacted by actions occurring in Garfield County. Table 10 lists these species and summarizes information on their habitat associations, potential for occurrence in the project vicinity based on known geographic range and habitats present, and potential for adverse impacts from the Proposed Action.

All four of these species have the potential to occur within the project area. Botany surveys were conducted in May 2013 in most of the upland areas, and along Riley Gulch in August 2013. A follow-up habitat assessment was conducted in October 2014 for portions of the road realignment which were not covered by the 2013 surveys.

DeBeque phacelia habitat was assessed using protocols developed by the USFWS (2013). Five areas of marginally suitable DeBeque phacelia habitat were mapped within 100 meters of the edge of disturbance. Four of these sites were within 50 to 100 meters of the edge of pad disturbance, and one additional site was 24 meters from the surface pipeline and 89 meters from the road realignment disturbance. No DeBeque phacelia plants were found during surveys. This is an ephemeral annual species which does not germinate every year. In general, 2013 was considered to be a good year for DeBeque phacelia at sites above 5,800 feet. The project area is at elevations ranging from approximately 5,700 to 6,050 feet, so it is unlikely that any of the marginally suitable habitat sites are occupied.

A limited amount of suitable habitat for Colorado hookless cactus was found on the west side of the MV 34-5 pad, but no plants were found. Suitable habitat for Parachute penstemon was found in Riley Gulch above the pad where Green River shale has washed down from above, but no plants were found during surveys. Micro-habitats for Ute lady's tresses were found along Riley Gulch, but August surveys found no plants, and the habitat was considered marginal for this species (WWE 2013a, WWE 2013b, Perkins field notes).

Table 10. 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 endemic species, such as Roan Cliffs blazing-star, Cathedral Bluffs meadow- rue, dragon milkvetch, Piceance bladderpod, and oil shale fescue	Yes	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	Yes	No
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 6000 feet	Desert shrubland with shadscale, galleta grass, black sagebrush, Indian ricegrass grading upward into big sagebrush and sagebrush/pinyon-juniper	Yes	No
Ute lady's tresses orchid *(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	Yes	No

Environmental Consequences

Proposed Action

Because no occurrences of any Federally listed plant species within or near the project area have been identified, and because no areas of suitable or marginally suitable habitat would be directly affected, the Proposed Action would result in no impacts to any Federally listed plants. Therefore, the effects determination is "**No Effect**" for Parachute penstemon, DeBeque phacelia, Colorado hookless cactus, and Ute lady's tresses.

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present.

Because no occurrences of any Federally listed plant species within or near the existing well pad have been identified, and because no areas of suitable or marginally suitable habitat would be directly affected by the No Action Alternative, no impacts to any Federally listed plants are expected. Therefore, the effects determination is "**No Effect**" for Parachute penstemon, DeBeque phacelia, Colorado hookless cactus, and Ute lady's tresses.

BLM Sensitive Plant Species

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 11, along with summaries of their habitat requirements, potential for occurrence within the project area, and potential to be impacted by the Proposed Action. Five of these species, Cathedral Bluffs meadow-rue, DeBeque milkvetch, Naturita milkvetch, Piceance bladderpod, and Roan Cliffs blazingstar, have the potential to occur in the project area.

Table 11. Potential for Occurrence of BLM Sensitive Plant Species

Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
Cathedral Bluffs meadow-rue (*Thalictrum heliophilum*)	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300-8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	Yes	No
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 shrublands	Yes	No

Table 11. Potential for Occurrence of BLM Sensitive Plant Species				
Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
Harrington's penstemon (*Penstemon harringtonii*)	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200-9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	No	No
Naturita milkvetch (*Astragalus naturitensis*)	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	Yes	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	Yes	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	Yes	No

Botanical surveys were conducted in May 2013, with follow-up habitat assessment of unsurveyed areas along the road realignment in October 2014. Suitable habitat was identified for DeBeque milkvetch and Naturita milkvetch, but no plants were found. Small areas of marginally suitable habitat for Cathedral Bluffs meadow-rue, Piceance bladderpod, and Roan Cliffs blazingstar were found in Riley Gulch above the pad, where Green River shale has washed down from above, but no plants were found (WWE 2013a, Perkins field notes).

Environmental Consequences

Proposed Action

Because no occurrences of any BLM sensitive plant species within or adjacent to the project area have been identified, the Proposed Action would have no adverse impacts on any BLM sensitive plant species.

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present.

Because no occurrences of any BLM sensitive plant species within or adjacent to the project area have been identified, this alternative would result in no impact to any BLM sensitive plant species.

Federally Listed, Proposed, or Candidate Animal Species

Affected Environment

Eight species of Federally listed, proposed, or candidate animal species are potentially present within or affected by actions in Garfield County. Table 12 lists these species and summarizes information on their distribution, habitat associations, and potential to occur or be adversely affected.

Table 12. 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*) – Threatened, Western Distinct Population Segment	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	Colorado River and major tributary rivers, including mainstem Colorado River upstream to town of Rifle in CRVFO.	General: Deep, slow runs, pools, and eddies. Spawning: silt to gravel substrates in shallow water and seasonally flooded overbank areas.	**Yes**	**Yes**
Colorado pikeminnow *(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.	**Yes**	**Yes**
Bonytail chub (*Gila elegans*) – Endangered			**Yes**	**Yes**
*Green Lineage Colorado River 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

*Green Lineage = Relict populations of cutthroat trout indigenous to the Colorado/Gunnison/Dolores River drainages. Currently protected under the ESA pursuant to prior listing of the greenback cutthroat trout (*O. c. stomias*) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.

Environmental Consequences

Proposed Action

Canada Lynx, Greater Sage-grouse, Mexican Spotted Owl, and Western Yellow-billed Cuckoo. None of these four species (distinct population segment for the cuckoo) is expected to occur in the project vicinity based on documented occurrences and habitat types present. Therefore, the Proposed Action would have "**No Effect**" on these species.

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

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

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

In contrast to inflow of sediments, the inflow of chemical pollutants could impact the endangered big-river fishes if concentrations are sufficient to cause acute effects. The potential for adverse impacts would be limited to the Colorado pikeminnow and razorback sucker, the two species known to occur within the CRVFO area. Spills or other releases of chemical pollutants as a result of oil and gas activities are infrequent in the CRVFO area due to the various design requirements imposed by BLM and the State of Colorado. In the event of a spill or accidental release into an ephemeral drainage that could flow to the

Colorado River, the operator would be required to implement its Spill Prevention, Control, and Countermeasures (SPCC) plan, including such cleanup and mitigation measures as required by BLM or the State. For these reasons, and because any spills into the Colorado River would be rapidly diluted to levels below that are not deleterious, or even detectable, the potential for adverse impacts from chemical releases is not considered significant.

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present. Because there would be no new ground disturbance, there would be no new impacts to Federally listed, proposed, or candidate wildlife.

BLM Sensitive Animal Species

Affected Environment

Table 13 lists BLM sensitive vertebrate wildlife species that are known to occur in the region and, if present, could potentially be adversely affected by the Proposed Action. Potential impacts to the species listed are discussed following the table.

Table 13. 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

Table 13. BLM Sensitive Vertebrate Species Present or Potentially Present in the Project Area		
Common Name	***Habitat***	***Potential for Occurrence***
Great Basin spadefoot (*Spea intermontana*)	Permanent or seasonal ponds and slow-flowing streams in pinyon-juniper woodlands and semi-desert shrublands.	Outside of range
Northern leopard frog (*Lithobates pipiens*)	Clean, perennial waters in slow-flowing streams, wet meadows, marshes, and shallows of clean ponds and lakes.	Possible – Habitat Marginal
Bluehead sucker (*Catostomus latipinnis*)	Primarily smaller streams with a rock substrate and mid to fast- moving waters; also shallows of larger rivers.	Present in Parachute Creek
Flannelmouth sucker (*Catostomus discobolus*)	Runs, riffles, eddies, and backwaters in large rivers.	Present in Parachute Creek
Roundtail chub (*Gila robusta*)	Slow-moving waters adjacent to fast waters in large rivers.	
*Blue Lineage Colorado River cutthroat trout (*Oncorhynchus clarki* ssp.)	Headwaters streams and ponds with cool, clear waters isolated from populations of non-native cutthroats and rainbow trout.	Present in Parachute Creek
*Blue Lineage = Relict populations of cutthroat trout indigenous to the Yampa/Green River drainages but widely transplanted throughout the state. Managed as a BLM sensitive species pursuant to prior designation of the Colorado River cutthroat trout (*O. c. pleuriticus*) pending completion of genetic and morphometric studies and taxonomic reassessment of native cutthroat trout in Colorado.		

Environmental Consequences

Proposed Action

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

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

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

Brewer's Sparrow. Although the habitat is marginal in the project area, the possibility exists of nesting by this species. The 60-day TL to prohibit removal of vegetation during the period May 1 to July 1

(Appendix) would avoid or minimize the potential for impacts to nesting Brewer's sparrows. Construction activities outside this period could cause individuals to avoid the disturbance while feeding. However, this impact would be limited in duration at any point along the corridor, and individuals are expected to feed across very large home ranges outside the nesting season, thus minimizing the severity of this potential indirect impact.

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

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

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be

implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present. Because there would be no new ground disturbance, there would be no new impacts to BLM sensitive animal species.

Vegetation

Affected Environment

The project area is located in Riley Gulch, a tributary of Parachute Creek northwest of Parachute, Colorado, at elevations ranging from approximately 5,700 to 6,050 feet. Vegetation in this area consists largely of a patchwork of pinyon-juniper woodlands and barren to sparsely vegetated hillsides. In the pinyon-juniper woodland areas, Utah juniper (*Juniperus osteosperma*) dominates, with scattered pinyon pine (*Pinus edulis*) along the slopes and ridgelines.

Interspersed areas commonly support a shrub community with a mix of sagebrush and salt desert shrubland species. These include black sagebrush (*Artemisia nova*), broom snakeweed (*Gutierrezia sarothrae*), fourwing saltbush (*Atriplex canescens*), galleta grass (*Pleuraphis jamesii*), greasewood (*Sarcobatus vermiculatus*), heartleaf twistflower (*Streptanthus cordatus*), Indian ricegrass (*Achnatherum hymenoides*), longflower rabbitbrush (*Chrysothamnus depressus*), green jointfir (*Ephedra viridis*), plains prickly pear cactus (*Opuntia polyacantha*), rubber rabbitbrush (*Ericameria nauseosa*), salina wildrye (*Leymus salinus*), shadscale (*Atriplex confertifolia*), sharpleaf twinpod (*Physaria acutifolia*), siltbush (*Zuckia brandegeei*), tansy-aster (*Machaeranthera* sp.), yellow milkvetch (*Astragalus flavus*), and Harriman's yucca (*Yucca harrimaniae*).

On higher elevation north-facing slopes, such as along the road realignment to the GM 41-8 pad, the vegetation shifts to a mountain shrub plant community. Common species here include basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*), creeping barberry (*Mahonia repens*), starry false Solomon's seal (*Maianthemum stellatum*), Gambel oak (*Quercus gambelii*), mountain-mahogany (*Cercocarpus montanus*), Saskatoon serviceberry (*Amelanchier alnifolia*), skunkbrush (*Rhus trilobata*), snowberry (*Symphoricarpos albus*), Woods' rose (*Rosa woodsii*), and Wyoming sagebrush (*Artemisia tridentata* ssp. *wyomingensis*). Occasional Douglas-fir (*Pseudotsuga menziesii*) trees are found in shady draws.

Riley Gulch runs through the project area, and a small wetland area occurs in the slump south of the MV 34-5 pad (indicated by pale blue in Figure 3 on page 5). Riley Gulch and this small wetland and riparian area support narrowleaf cottonwood (*Populus angustifolia*), sandbar willow (*Salix exigua*), box-elder (*Negundo aceroides*), common chokecherry (*Prunus virginiana*), knotted rush (*Juncus nodosus*), broadleaf cattail (*Typha latifolia*), scouring rush (*Equisetum hyemale*), pale spikerush (*Eleocharis macrostachya*), and red columbine (*Aquilegia elegantula*). Noxious weeds, including Canada thistle, houndstongue, and tamarisk, are also common in these areas. Wetland vegetation adjacent to Riley Gulch, where the existing access road to the MV 34-5 leaves the main Riley Gulch Road, has been heavily impacted in the past by road construction and culvert installation.

Existing roadside areas, well pads, and livestock concentration areas are infested with non-native species and noxious weeds, including bur buttercup, cheatgrass, common mullein, field bindweed, field brome, kochia, redstem filaree, smooth brome, and yellow sweetclover. A native early successional species, curlycup gumweed (*Grindelia squarrosa*), is also common in these areas.

Environmental Consequences

Proposed Action

Under the Proposed Action, a total of 6.11 acres of native pinyon-juniper woodland, mountain shrub vegetation, and sagebrush-salt desert shrub vegetation would be removed. An additional 2.16 acres of previously disturbed and reclaimed vegetation would also be removed. Combined with the existing disturbance of 1.45 acres, there would be a total of 9.72 acres of disturbance for this project. All of the disturbance would occur on BLM land. Following project completion, 6.47 acres would undergo interim reclamation, and 3.25 acres would remain as long-term disturbance. Interim reclamation would consist of seeding in accordance with the reclamation COAs presented in the Appendix, using a seed mix consisting of native grasses, forbs, and shrubs. Previously disturbed riparian and wetland areas along Riley Gulch would be restored using willow cuttings and other native riparian species following completion of the road realignment (see Waters of the U.S. in the section on Water Resources – Surface for additional discussion about the wetland area along Riley Gulch).

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

Additional indirect impacts to adjacent vegetation could occur from noxious weeds and other non-native plants associated with project area disturbances. The proposed removal of native vegetation would increase the site vulnerability to invasion and establishment of noxious weeds and other non-native invasive plant species, particularly with the existing widespread establishment of noxious weeds and other non-native species. Neighboring vegetation would also become more vulnerable to invasion by noxious weeds and other non-native species. Ground disturbance combined with vehicle traffic and construction equipment provides both excellent habitat and vectors for invasive species, particularly when these species are already present within the soil seed bank (Schmidt 1989, Parendes and Jones 2000, Gelbard and Belnap 2003, Larson 2003, Zaenepoel et. al. 2006).

These non-native species can negatively impact native plant communities, both directly through competition for resources, and indirectly through alteration of soil microbial communities (Klironomos 2002, Hierro et. al. 2006, Reinhart and Callaway 2006, Vogelsang and Bever 2009). Herbicide treatments of noxious weeds can also result in negative effects or mortality to native plants if they are co-occurring or located nearby (BLM 2007b). Implementation of standard COAs for noxious weeds and temporary reclamation (Appendix) would reduce the risk of noxious weed and invasive species establishment and spread through the combination of chemically treating noxious weeds while also reestablishing desirable vegetation through interim reclamation.

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary, and there would be no new impacts to vegetation. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present.

Because this alternative would result in no new ground disturbance, no new impacts to vegetation are expected. However, because existing wells would remain in production, vegetation adjacent to the existing well pad and access road would continue to be subject to ongoing effects from dust deposition, invasive species, and herbicides.

Visual Resources

Affected Environment

The Proposed Action is located on BLM land approximately 3 air-miles west of Parachute, Colorado. The BLM land is classified as Visual Resource Management (VRM) Class II as identified by the 1984 Glenwood Springs Resource Management Plan. The objective for VRM Cla**ss** II, as defined in the BLM's Manual H-8410-1 – Visual Resource Inventory (BLM 1986), is described below.

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

The Proposed Action is located within Visual Resource Inventory (VRI) Class 2, Scenic Quality Class B, Sensitivity Level High, and is within the Foreground/Middleground Distance Zone.

The project area lies within Riley Gulch, a tributary of Parachute Creek that runs in southwest-northeast direction just to the north of Mount Callahan. Riley Gulch is bounded by a steep ridgeline that descends from the ridgeline between Mount Callahan and Cathedral Peak to the north, the Parachute Creek valley bottom to the east, Mount Callahan to the south, and the ridgeline between Mount Callahan and Cathedral peak to the west. The natural landscape has been historically altered with human modifications associated with oil and gas development including associated well pads, pipelines, and access roads. Vegetation consists of patchy pinyon-juniper woodlands intermixed with sparsely vegetated hillsides with tan to salmon colored exposed soils.

Environmental Consequences

Proposed Action

County Road 215 (Parachute Creek Road) and private field development roads provide the primary access to the project location. However, there is no public access to the project area because the primary access road crosses private land. The Proposed Action is within the background of the Parachute Creek Valley but is not visible from the valley floor because it is located in the upper reaches of Riley Gulch and is

screened by the adjacent topography that encloses the gulch. The Proposed Action would only be visible to the casual observer who has access to the project location or has access to the private lands above Riley Gulch. Although the Proposed Action would include new surface disturbance in addition to what exists within the project area, over the long-term the improvements that would be made to the road and well pad would reduce the visual impacts created by erosion and slumping.

The road would realigned to avoid areas of slumping and would be designed and constructed to improve surface drainage and to improve vehicle accessibility by reducing road grades. As new road segments are constructed, the existing steeper sections would be taken out of service and reclaimed. The well pad would be designed, constructed, and reclaimed to avoid disturbance to the nearby slump areas and would, for the most part, fall within the existing footprint with the exception of two excess material stockpiles and a portion of the cutslope. The Proposed 10-inch natural gas pipeline and 4-inch produced water pipeline would be buried concurrently in the same trench from a connection point along the realigned access road to the pad. The new pipelines would connect to an existing pipeline system in Riley Gulch.

Short-term visual impacts due to the expansion of the well pad, access road realignment, gas gathering pipeline, and water collection pipeline would occur within the project area. Contrast would be created in the landscape by removing existing vegetation, exposing bare ground, and creating distinct lines and forms in the landscape. There would also be an increase in the presence of drilling rigs, heavy equipment (e.g. dozers, graders, track hoes), and vehicular traffic with an increase in dust and light pollution. Long-term impacts associated with the Proposed Action include additional production equipment which would increase the existing visual contrast associated with human modifications already present in the area.

In summary, the VRM Class II objective is to retain the existing character of the landscape and to allow for a low level of change to occur in the landscape. However, the changes that are proposed would improve the existing character of the landscape. In addition, the Proposed Action has limited visibility because of its location and limited accessibility. The Proposed Action would not attract the attention of a casual observer in a location that is accessible to the public (for example, County Road 215/Parachute Creek Valley Road). Overall, the contrast created by the Proposed Action diminishes against the scale of Riley Gulch and the two peaks (Mount Callahan and Cathedral Peak) that dominate in the background. Additional reductions in contrast would be realized by implementing the standard Best Management Practices (BMPs) related to reclamation and facility paint colors, and screening production facilities from view (Appendix). With these mitigation measures, long-term visual impacts would be reduced and the Proposed Action would meet the VRM Class II objective.

No Action Alternative

The No Action Alternative would constitute denial of the Federal APDs described in the Proposed Action, meaning that the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad and impacts to visual resources would be the same as at present.

Wastes – Hazardous or Solid

Affected Environment

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

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

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

- The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510 of 1980) provides for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment. It also provides national, regional, and local contingency plans. Applicable emergency operations plans in place include the National Contingency Plan (40 CFR 300, required by section 105 of CERCLA), the Region VIII Regional Contingency Plan, the Colorado River Sub-Area Contingency Plan (these three are Environmental Protection Agency produced plans), the Mesa County Emergency Operations Plan (developed by the Mesa County Office of Emergency Management), and the BLM Grand Junction Field Office Hazardous Materials Contingency Plan.

- The Resource Conservation and Recovery Act (RCRA) (Public Law 94-580, October 21, 1976) regulates the use of hazardous substances and disposal of hazardous wastes. Note: While oil and gas lessees are exempt from RCRA, right-of-way holders are not. RCRA strictly regulates the management and disposal of hazardous wastes.

Emergency response to hazardous materials or petroleum products on BLM lands is 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

Pollutants potentially spilled or otherwise accidentally released during the construction phase of the project would include diesel fuel, hydraulic fluid, and lubricants associated with the operation of heavy

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

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

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

Because of the use or production of solid and hazardous wastes, the potential exists for accidental contamination of surface water or groundwater. While uncommon, an accident could occur that would result in a release of one or more of these materials directly or indirectly into surface waters or in a way that poses a potential for transport to groundwater. For example, improper casing and cementing of the boreholes could result in the contamination of groundwater resources. Releases are also possible from tanks used for storage on the pads, from haul trucks used to transport materials to and from the pads, or from pipelines. Storage tanks on the pad are required to be placed within an area of secondary containment equal to 110% of the volume of the enclosed tanks.

In the event of any release of a hazardous substance to the environment in reportable quantities, the responsible party is required to implement a Spill Prevention, Control, and Countermeasures (SPCC) Plan and is liable for cleanup and monetary 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 wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad and impacts to wastes, hazardous or solid, would be the same as at present.

Without the implementation of the Ant Hill Road Improvements and its related road reclamation work, the excessively steep access road would continue to be used by heavy trucks. Thus, vehicle accessibility would continue to damage the roadway, heavy truck travel during rig moves would continue to require a dozer to pull vehicles up the steep road pitches, and the risk of an accident or spill due to these road conditions would continue.

Water Resources – Surface and Ground

Surface Water

Affected Environment

The project lies approximately 5.1 miles northwest of Parachute, Colorado in the middle reaches of Riley Gulch, an ephemeral drainage. Riley Gulch flows northeasterly below the project site for approximately 1.5 miles to Parachute Creek and on to the Colorado River, approximately 3 miles to the southeast. According to the *Stream Classifications and Water Quality Standards* (CDPHE, Water Quality Control Commission [WQCC] Regulation No. 37) (CDPHE 2007) the mainstem of Parachute Creek, including all tributaries and wetlands, from the confluence of the west and east forks to the confluence with the Colorado River are within Segment 11h. The following is a brief description of Segment 11h.

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

All streams within Segment 11h are not on the State of Colorado's 303(d) List of Impaired Waters and Monitoring and Evaluation List (CDPHE, WQCC Regulation No. 93) (CDPHE 2010). The Colorado River, of which Parachute Creek is a tributary, is currently considered impaired due to naturally high levels of selenium. Colorado's Monitoring and Evaluation List identifies waterbodies where there is reason to suspect water quality problems, but uncertainty also exists regarding one or more factors. No stream segments on Riley Gulch or Parachute Creek are on the State of Colorado's Monitoring and Evaluation List (CDPHE 2010).

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

At this time, minimal water quality data are available for Riley Gulch near the MV 34-5 pad site. A water sample collected from Riley Gulch by BLM personnel on April 16, 2004, had a temperature of 21°C (69.8°F), a conductivity of 1,372 microsiemens per centimeter (µS/cm), and a pH of 8.7 standard units (SU). Data have been collected on Parachute Creek to which Riley Gulch drains and are presented in Table 14.

Table 14. Selected Water Quality Data for Two Sampling Locations near the Project Area		
Parameter	***Parachute Creek near Parachute, CO USGS Site #09093000***	
	7/29/1981	***5/09/1980***
Instantaneous discharge (cfs)	4.4	420
Temperature, water (°C)	12.5	NA
Field pH (SU)	9.2	8.3
Specific conductance (µS/cm at 25°C)	913	460
Total dissolved solids (mg/L)	576	400
Hardness as $CaCO_3$ (mg/L)	340	200
Chloride (mg/L)	22	4.6
Selenium (µg/L)	2	1
Dissolved oxygen (mg/L)	7.8	10
NA = data not available Source: USGS 2007		

Environmental Consequences

Proposed Action

The proposed Ant Hill Road Improvements including the segments in the vicinity of the MV 34-5 pad would result in 4.01 acres of initial disturbance and yield 1.81 acres of long-term disturbance accounting for the roadway and ditches. The new pipeline disturbances would be included in the road figures. Since the welded steel frac lines would be cabled and pulled cross-country or laid along existing roads, there is no specific disturbance allowance. The total short-term disturbance (9.72 acres) for the project would occur on BLM land with a corresponding long-term surface impact of 3.25 acres (Table 1).

Direct impacts to Riley Gulch and its unnamed ephemeral tributaries and the Colorado River could occur but would be minimized and mostly avoided by many design features of the pad expansion, access road improvements and road maintenance. All road sections would be maintained and graveled, as needed. The various segments of road to be removed from service would be recontoured, seeded and reclaimed to control erosion and to support other land uses. Care has been taken in project planning to avoid existing, active slump areas and minimize disturbances on steep slopes. Particular care should be taken to ensure that proper BMPs, including the COAs listed in the Appendix are utilized to prevent erosion and slope instability due to construction activities.

Potential impacts to surface water associated with the Proposed Action are associated with 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 result in a loss of vegetation cover, soil compaction and displacement, increased volume and velocity of runoff, and increased sedimentation and, potentially, salinity in surface waters. Impacts can be minimized by implementing stormwater management BMPs, stockpiling topsoil, controlling erosion, and rehabilitating disturbed surfaces quickly.

Long-term soil protection would be achieved by continued road and pad maintenance to reduce erosion, by remediation of contaminated soils, and by minimizing the long-term pad disturbance footprints with interim reclamation. 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 roads in the project area to a compacted thickness of 6 inches (Appendix).

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. The use, storage, and transportation of fluids (such as produced water, hydraulic fracturing fluids, and oil condensate) increase the risk of spills that could impact water resources.

Certain measures of the Proposed Action are designed to minimize and mitigate risks to surface waters associated with the release of drilling fluids, produced water, and condensate. A closed-loop drilling system would be implemented which recycles drilling fluids. Water-based cuttings would be dried through the use of a shaker system, decontaminated to COGCC standards, and stacked against the cutslope on the pad. Should a synthetic-based mud be used for drilling the three horizontal wells, prior sundry approval would be required with consideration that cuttings would be hauled to an approved disposal site. A traditional reserve pit would not be constructed. Completions would be conducted from the remote Riley Gulch Frac Pad, and fluids would be stored in surface containment tanks.

In addition to individual containment measures, the entire pad would be bermed to contain an accidental release on the pad. In the event of an accidental release, produced water and condensate would be confined for cleanup in a containment area to prevent migration 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) would minimize risks of adverse impacts associated with construction and ongoing production activities.

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to those of the present.

The proposed Ant Hill Road Improvements, which would likely decrease erosion and sedimentation, would not be implemented. Without the implementation of the Ant Hill Road Improvements and its related road reclamation work, the excessively steep access road would continue to be used by heavy trucks. Thus, vehicles would continue to damage the roadway, heavy truck travel during rig moves would continue to require a dozer to pull vehicles up the steep road pitches, and the risk of an accident or spill due to these road conditions would continue.

Waters of the U.S.

Affected Environment

Waters of the U.S. located in the project vicinity include Riley Gulch and Parachute 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.

Culvert removal and replacement is planned in connection with the Ant Hill road work across Riley Gulch and an ephemeral tributary. These drainages appear to be jurisdictional Waters of the U.S. based on a distinct channel and downstream connectivity to Parachute Creek and thence to the Colorado River. As shown in pale blue in Figure 3, a wetland is situated on an ephemeral tributary of Riley Gulch south of the MV 34-5 pad. This wetland appears to have been created by incidental impoundment of runoff upstream from an existing 48-inch culvert that is undersized and does not adequately convey stormflows. Wetland and riparian vegetation also occurs along Riley Gulch within the project vicinity, both upstream and downstream from an existing 36-inch culvert beneath the access road to the MV 34-5 pad. See the mention of wetland and riparian species in the section on Vegetation.

Environmental Consequences

Proposed Action

Under this alternative, the existing 48-inch culvert would be removed, and the associated portion of existing roadway would be abandoned and reclaimed. Following culvert removal, the currently culverted segment of the ephemeral tributary would be reconstructed to blend with natural contours of the channel and adjacent banks. Although the wetland downstream from this culvert would be avoided during culvert replacement, removal of the 48-inch culvert would potentially affect wetland hydrology. The area of impact to the ephemeral channel in connection with this culvert removal is estimated at 3 feet of channel width along a channel length of 80 feet (240 square feet, 0.0055 acres). Most of this length currently consists of the existing culvert. The downgradient wetland area is an estimated at 0.09 acre and 0.01 acre of open water..

In addition to this culvert removal and channel reestablishment, an existing 36-inch culvert that conveys Riley Gulch beneath the MV 34-5 access road would be replaced with a 96-inch culvert to better convey stormflows, which frequently exceed the capacity of the existing culvert. This aspect of the project would disturb 60 feet of channel length, mostly associated with the existing culvert, representing approximately 160 square feet (0.0036 acre) of disturbance. To minimize erosion and sedimentation, riprap would be placed at the inlet and outlet of the 96-inch culvert. In addition, a sediment trap would be placed at the culvert outlet. The BLM anticipates that removal of the existing culvert and installation of the new culvert to better convey stormflows would be accomplished per 33 CFR Part 330 and USACE Nationwide Permit General and Regional Conditions.

An excess soil stockpile area is proposed south of the MV 34-5 pad and approximately 50 feet from Riley Gulch. Transport of sediments from this area into Riley Gulch would be avoided by surrounding the stockpile with an earthen berm to be stabilized with native grasses. A silt fence or other best management practice would also be installed between the stockpile and the nearest drainage, and runoff from the stockpile would be routed through a sediment trap.

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to those of the present.

Without the implementation of the Ant Hill Road Improvements and its related road reclamation work, the excessively steep access road would continue to be used by heavy trucks. Vehicles would continue to damage the roadway, heavy truck travel during rig moves would continue to require a dozer to pull

vehicles up the steep road pitches, and the risk of an accident or spill due to these road conditions would continue.

Groundwater

Affected Environment

The Lower Piceance Basin contains both alluvial and bedrock aquifers (CGS 2003). Unconsolidated alluvial aquifers are the most productive aquifers in the region (USEPA 2004) and are defined as narrow, thin deposits of sand and gravel formed primarily along stream courses, in this case, along the Colorado River and its tributaries. Alluvial well depths are generally less than 200 feet and water levels typically range between 100 to 150 feet. Well yield is dependent upon the intended use of the well, well construction design, sediment type and saturated thickness. Domestic wells are limited to 15 gallons per minute (gpm) administratively, while municipal wells are designed and constructed for maximum 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 present beneath higher portions of the project area, but no water wells are completed within either the upper or lower bedrock aquifers units as described above. Beneath these two aquifer systems is a confining unit consisting of the Wasatch Formation and the lower two members of the overlying Green River Formation. Some fresh-water wells are completed in localized water-bearing intervals within this unit.

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

Water quality of the upper Piceance Basin aquifer 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. Although no primary (health-based) water quality standard has been established for TDS, the secondary (aesthetic, or non-health-based) standard for TDS in drinking water is 500 mg/L or less (USEPA 2006).

Water quality of the Mesaverde aquifer is highly variable, with concentrations of dissolved solids ranging from less than 1,000 mg/L in many of the basin-margin areas to more than 10,000 mg/L in the central part of the Piceance Basin (USEPA 2004). In general, areas of the aquifer that are recharged by infiltration from precipitation or surface water contain relatively fresh water. However, water quality in the Piceance Basin is generally poor overall due to the presence of nahcolite deposits and salt beds throughout the basin. Only very shallow waters such as those from the surficial Wasatch Formation are used for drinking water (USEPA 2004).

According to the Colorado Division of Water Resources (CDWR), a cluster of five fresh-water wells are located within a 1.0-mile buffer of the proposed action. The wells are located than 1 mile southwest of the proposed well pad, in Section 8, T7S, R96W. The wells are all classified as monitoring wells, with a depth of 35-36 feet.

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. These typically 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 is 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).

Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

For decades, oil and gas companies and independent geophysicists have used state of the art equipment to monitor microseismic activity—defined as a "faint" or "very slight" tremor—during hydraulic fracturing to optimize well completions and to gather information about fracture dimensions and propagation (Warpinski 2009). These data give an indication about the magnitude of seismic activity associated with hydraulic fracturing, dimensions of resultant fractures in geologic formations, and probability for induced fractures to extend into nearby aquifers, if present. Research indicates that microseismic activity created by hydraulic fracturing occurs at Richter magnitude 1.0 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 1.0 tremor is 1/100th the amplitude of a magnitude 3 tremor. The National Academy of Sciences reviewed more than 100,000 oil and gas wells and waste water disposal wells around the world and concluded that "incidences of felt induced seismicity appear to be very rare," with only one such documented occurrence (NAS 2012).

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

Hydraulically induced fracture orientation in relation to the wellbore depends upon the downhole environment (i.e., rock mechanics, minimum and maximum principle stress directions, rock physical

properties, etc.) and the wellbore trajectory. In vertical or normal directional wells such as in the Mesaverde formation—the predominant hydrocarbon-producing formation in the CRVFO area—fracture growth is primarily lateral or outward from the wellbore, with minimal secondary fractures extending at some angle away from the lateral fractures.

In horizontal wells such as being used to develop deep marine shales, fracture growth from the wellbore is mainly determined by the orientation of the wellbore in relation to the principal stresses of the rock. Fracture growth toward the surface is limited by barriers such as variations in stress and lithology, as is also the case in vertical and normal directional wells. In some horizontal wells, fracture growth is similar to that in vertical or normal directional wells due to wellbore trajectory along the maximum principal stress direction. Analysis of data from thousands of wells indicates fracture extent (length) of less than 350 feet in the vast majority of cases, with outliers of 1,000 to 2,000 feet (Maxwell 2011, Davies et al. 2012). The extreme outlier lengths are associated with fractures in thick deposits of lithologically uniform marine shales.

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

Based on a review of available information on microseismic monitoring and fracture dimensions, Fisher and Warpinski (2011) concluded that fractures from deep horizontal wells are not a threat to propagate across the long vertical 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 shallow fresh-water wells are 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 space between the casing and borehole wall is 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 15). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 15 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 15 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 15. The sand listed in the table is used as a proppant to help keep the newly formed fractures from closing.

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

Table 15. Constituents of Typical Hydraulic Fracturing Operations 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 that produce corrosive/poisonous by-products	Disinfectant; sterilizer for medical and dental equipment
Breaker	Ammonium persulfate	0.010	Allows delayed breakdown of the gel	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	Low-sodium table salt substitutes, medicines, and IV fluids
Corrosion inhibitor	Formic acid	0.002	Prevents corrosion of well casing	Preservative in livestock feed; lime remover in toilet bowl cleaners
Crosslinker	Borate salts	0.007	Maintains fluid viscosity as temperature increases	Laundry detergents, hand soaps, and cosmetics
Friction reducer	Polyacrylamide	0.088	"Slicks" water to minimize friction	Flocculant in water treatment and manufacture of paper
Gelling agent	Guar gum	0.056	Thickens water to help suspend the sand propping agent	Thickener, binder, or stabilizer in foods
Iron control	Citric acid	0.004	Prevents precipitation of metal oxides	Flavoring agent or preservative in foods
Surfactant	Lauryl sulfate	0.085	Increases viscosity of the fluid	Soaps, shampoos, detergents, and foaming agents
pH adjusting agent	Sodium hydroxide, acetic acid	0.011	Adjusts pH of fluid to maintain 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	Dishwashing liquids and other cleaners
Winterizing agent	Ethanol, isopropyl alcohol, methanol	--	Added as necessary as stabilizer, drier, and anti-freezing agent	Various cosmetic, medicinal, and industrial uses
Total Additives		**0.49**		
Total Water and Sand		**99.51**		
*FracFocus Chemical Disclosure Registry, fracfocus.org/chemical-use/what-chemicals-are-used **USDOE 2009				

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

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

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

No Action Alternative

Under the No Action Alternative, the MV 34-5 pad expansion would not occur, the proposed Federal wells would not be drilled, and installation of the associated gas and water pipelines would not be needed. However, the five existing wells would continue to be produced, resulting in future activities similar to present conditions. Because no new surface disturbance or additional wells are associated with this alternative, no new direct or indirect impacts to groundwater are anticipated. However, existing impact types and levels would continue.

Wildlife

Aquatic Organisms

Affected Environment

Parachute Creek, a perennial stream and tributary of the Colorado River, is located approximately 1.5 miles northeast of the existing MV 34-5 pad. Fish surveys in the upper reaches of Parachute Creek conducted by CPW and BLM have documented a small population of Blue Lineage Colorado River cutthroat trout, a native trout listed as sensitive by the BLM and discussed in the section on Special Status Species. The brown trout (*Salmo trutta*), a non-native sportfish widely stocked throughout the region, also inhabits the creek. This trout of eastern North America has been widely introduced in mountainous areas of Colorado because of its tolerance for slightly warmer waters than the cutthroat trout and its ability to reproduce successfully in streams with small flows.

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

Slow-flowing portions of Parachute Creek with fine substrates, aquatic macroinvertebrates are likely to support the larvae of certain true flies such as midges (Chironomidae) and mosquitoes (Cuculidae) as well as some species of caddisflies. These species are able to tolerate relatively warm, turbid, and poorly oxygenated waters, and their more abbreviated larval stages allow them to reproduce in intermittent streams and in seasonally inundated overbank areas.

Environmental Consequences

Proposed Action

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present. Because no new ground disturbance would occur, new impacts to aquatic organisms are not expected.

Migratory Birds

Affected Environment

The project area grades from pinyon-juniper woodlands to sagebrush grasslands and Gambel oak thickets as the elevation increases on Flatiron Mesa. This mix of vegetation provides cover, forage, breeding, and nesting habitat for a variety of migratory birds.

Species on the U.S. Fish and Wildlife Service (2008) list of Birds of Conservation Concern (BCC) for the project region include two species associated with pinyon-juniper woodlands, the pinyon jay (*Gymnorhinus cyanocephalus*) and juniper titmouse (*Baeolophus griseus*). Another BCC species, Cassin's finch (*Haemorhous cassinii*), nests in higher elevation montane and subalpine conifer forests but

commonly moves into pinyon-juniper woodlands following nesting and throughout winter. None of these species was observed during the most recent survey (WWE 2013a). Non-BCC species associated with this habitat type include the broad-tailed hummingbird (*Selasphorus platycercus*), black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), gray flycatcher (*Empidonax oberholseri*), Townsend's solitaire (*Myadestes townsendii*), plumbeous vireo (*Vireo plumbeus*), gray vireo (*V. vicinior*), blue-gray gnatcatcher (*Polioptila caerulea*), American robin (*Turdus migratorius*), mountain bluebird (*Sialia sialis*), black-throated gray warbler (*Dendroica nigrescens*), chipping sparrow (*Spizella passerina*), lark sparrow (*Chondestes grammacus*), and lesser goldfinch (*Spinus psaltria*). Primarily a resident species, the mountain chickadee (*Poecile gambeli*) is sometimes present in well-developed pinyon-juniper, especially in the upper margins or in associated montane conifers.

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

Oakbrush and mixed mountain shrub habitats in the area are suitable for migrants such as common poorwill (*Phalaenoptilus nuttallii*), dusky flycatcher (*Empidonax oberholseri*), western scrub-jay (*Aphelocoma californica*), Virginia's warbler (*Oreothlypis virginiae*), MacGillivray's warbler (*Geothlypis tolmiei*), spotted towhee (*Pipilo maculatus*), green-tailed towhee (*P. chlorurus*), black-headed grosbeak (*Pheucticus melanocephalus*), and lazuli bunting (*Passerina amoena*). A resident species, the black-capped chickadee (*Poecile atricapillus*) is sometimes present in mature oakbrush but primarily in larger deciduous trees along drainages.

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

Environmental Consequences

Proposed Action

The Proposed Action would result in a loss of nesting, roosting, perching, and foraging habitat for migratory birds on disturbed areas and reduce habitat effectiveness adjacent to areas where disturbance-related effects could be expected. The MV 34-5 pad expansion and Ant Hill road work would result in 9.72 acres of surface disturbance occurring on BLM land. These changes to the habitat could negatively affect bird species that require large expanses of intact habitat. Habitat fragmentation could result in increased competition, increased exposure to predators, and a higher likelihood of nest parasitism. It is also possible that individual nests could be destroyed if the well pad, pipeline, and production facilities are constructed during the nesting season.

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

All migratory bird species are protected by the Migratory Bird Treaty Act (MBTA), which makes it unlawful to pursue, hunt, kill, capture, possess, buy, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition to the MBTA, Executive Order 13186 sets forth the responsibilities of Federal agencies to further implement the provisions of the MBTA by integrating bird conservation principles and practices into agency activities and by ensuring that Federal actions evaluate the effects of actions and agency plans on migratory birds. Consistent with Executive Order 13186 and BLM Colorado guidelines, CRVFO has established as a COA (Appendix) a Timing Limitation (TL) prohibiting initiation of vegetation removal or ground-disturbing activities during the period **May 1 to July 1**, the peak period for incubation and brood rearing among migratory birds in the project vicinity. The BLM may grant an exception to this COA if surveys by a qualified biologist during the nesting season of BCC species potentially present indicate no active nests within 30 meters (100 feet) of the disturbance area.

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present. Because this alternative would result in no new ground disturbance, additional impacts to migratory birds are not expected.

Other Terrestrial Species

Affected Environment

The project area would be located in medium density pinyon-juniper woodlands with openings of sagebrush; dense mountain brush becomes more predominant at the higher elevations of the project area with aspen stands at the highest elevations. Understory vegetation consists of mostly native grasses and forbs with some cheatgrass. Given these vegetation types, the area provides cover, forage, breeding, and nesting habitat for a variety of big game and small game species as well as nongame species.

MAMMALS

The project area is within overall ranges of mule deer (*Odocoileus hemionus*) and Rocky Mountain elk (*Cervus elaphus nelsoni*), which are recreationally important species that are common throughout suitable habitats in the region. Because of its low elevation the project area is primarily winter range, which means that deer and elk populations increase during the winter months when animals migrate to lower elevations from the Battlements to the south. Winter densities of big game animals in a given area are dependent on the type of habitat present and the severity of the winter. Deeper snows and colder temperatures result in increase in the number of big game animals using the area. Although most of the area is mapped as mule deer winter range, the project area also receives use by deer during the summer.

Large carnivores potentially present in the project vicinity include the mountain lion (*Felis concolor*), which moves seasonally with its preferred prey, the mule deer, and the black bear (*Ursus americanus*). Black bears are uncommon in the lowlands north of I-70 due to the scarcity of sufficient forest cover and suitable foods (including acorns and berries). Two smaller carnivores, the coyote (*Canis latrans*) and bobcat (*Lynx rufus*), are also present throughout the region in open habitats and broken or wooded terrain, respectively, where they hunt for small mammals, reptiles, and ground-dwelling birds. Other small carnivores potentially present are the raccoon (*Procyon lotor*) and striped skunk (*Mephitis mephitis*) primarily along Beaver Creek and their close relatives the ringtail (*Bassariscus astutus*) and spotted skunk (*Spilogale gracilis*) in drier and more rugged, higher terrain and along smaller drainages.

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

BIRDS

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

A raptor survey completed in May 2013 did not find any occupied raptor nests within 0.25 mile of the proposed pad or 0.125 mile of the proposed road. Due to the transitory nature of many raptor species, the area will need to be resurveyed if the development is to be initiated in subsequent raptor nesting seasons (Appendix).

Passerine (perching) birds commonly found in the area include year-round residents such as the common raven (*Corvus corax*), American crow (*C. brachyrhynchos*), black-billed magpie (*Pica hudsonia*), and house finch (*Haemorhous mexicanus*). These are in addition to passerines described under Migratory Birds and Special-Status Species.

REPTILES AND AMPHIBIANS

The project area is within elevational range of most reptile species known to occur in Garfield County. Species most likely to occur include the short- horned lizard, (*Phrynosoma hernandesi*), plateau (western fence) lizard (*Sceloporus undulatus*), tree lizard (*Urosaurus ornatus*), and gopher snake (bullsnake) (*Pituophis catenifer*) in pinyon-juniper woodlands, sagebrush shrublands, or grassy clearings. Other reptiles potentially present along riparian areas are the milk snake (*Lampropeltis triangulum*), western terrestrial garter snake (*Thamnophis elegans*), and smooth green snake (*Liochlorophis vernalis*).

The area is also within the known range of Woodhouse's toad (*Anaxyrus woodhousii*), and western chorus frog (*Pseudacris triseriata*). Within the CRVFO and vicinity, Woodhouse's toad occurs 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 western chorus frog occurs primarily in cattail and bulrush wetlands and along the vegetated margins of seasonal or perennial ponds and slow-flowing streams.

Environmental Consequence

Proposed Action

Direct impacts to terrestrial wildlife from the Proposed Action may include mortality, disturbance, nest abandonment/nesting attempt failure, or site avoidance/displacement from otherwise suitable habitats. These effects could result from the 9.72 acres of habitat loss or modification, increased noise from vehicles and operation of equipment, increased human presence, and collisions between wildlife and vehicles. Impacts would be more substantial during critical seasons such as winter (deer and elk) or the spring/summer breeding season (raptors, songbirds, amphibians).

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

No Action Alternative

Under the No Action Alternative, the proposed Federal wells would not be drilled or developed, the MV 34-5 pad expansion would not occur, and the installation of the buried gas and water pipelines and surface frac water lines would not be needed. The planned Ant Hill Road Improvements would not be implemented, nor would the road reclamation benefits be realized. No new surface disturbances on BLM land would be necessary. However, the five producing Federal wells would continue to be produced. Future levels of activity at the pad would be the same as at present. Because no new ground disturbance would occur under this alternative, no new impacts to other terrestrial wildlife are anticipated.

SUMMARY OF CUMULATIVE IMPACTS

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

Although none of the cumulative impacts was described in the 1999 FSEIS (BLM 1999a) as significant, and while new technologies and regulatory requirements have reduced the impacts of some activities,

many existing and future actions will continue or begin to have adverse effects on various elements of the human and natural environment. Anticipated impacts for existing and future actions range from negligible to locally major, and primarily negative, for specific resources.

The primary bases for this assessment are twofold: First, although the rate of development, including oil and gas development, has slowed in recent years due to the general economic downturn and depressed natural gas prices, some development continues to occur, adding to the previous residential, commercial, and industrial growth and to the previous habitat loss, modification, and fragmentation. Second, 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 in effect to the same extent as on BLM lands. However, COGCC regulations enacted in recent years have closed considerably the former gap between the potential environmental impacts associated with development of private versus Federal fluid mineral resources.

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

PERSONS AND AGENCIES CONSULTED

Colorado Oil and Gas Conservation Commission – Dave Kubeczko

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INTERDISCIPLINARY REVIEW

BLM staff from the CRVFO who participated in the preparation of this EA, including review of survey results submitted by the operator's consultants, evaluation of impacts likely to occur from implementation of the Proposed Action, and identification of appropriate COAs to be attached and enforced by BLM, are listed in Table 16.

Table 16. BLM Interdisciplinary Team Authors and Reviewers

Name	***Title***	***Areas of Participation***
John Brogan	Archaeologist	Cultural Resources, Native American Religious Concerns
Jim Byers	Natural Resource Specialist	EA Project Lead, Access & Transportation, Socioeconomics, Wastes-Hazardous or Solid,
Vanessa Caranese	Geologist	Geology and Minerals, Groundwater, Paleontology
Allen Crockett, Ph.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Bob Hartman	Petroleum Engineer	Downhole COAs
Julie McGrew	Realty Specialist	Visual Resources, Realty
Judy Perkins, Ph.D.	Botanist	Invasive Nonnative Species, Special Status Plants, Vegetation

Table 16. BLM Interdisciplinary Team Authors and Reviewers		
Name	***Title***	***Areas of Participation***
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special Status Species Animals, Aquatic and Terrestrial Wildlife
Carmia Woolley	Physical Scientist	Air Quality, Noise, Soils, Surface Water, Waters of the U.S.

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APPENDIX

CONDITIONS OF APPROVAL

MV 34-5 Pad Expansion Project Including Ant Hill Road Improvements

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SURFACE-USE CONDITIONS OF APPROVAL
MV 34-5 Pad Expansion Including Ant Hill Road Improvements
DOI-BLM-CO-N040-2014-0100-EA

GENERAL COAS APPLICABLE TO ALL SURFACE DISTURBANCE ASSOCIATED WITH THE PROJECT

1. Administrative Notification. The operator shall notify the BLM representative at least 48 hours prior to initiation of construction. If requested by the BLM representative, the operator shall schedule a pre-construction meeting, including key operator and contractor personnel, to ensure that any unresolved issues are fully addressed prior to initiation of surface-disturbing activities or placement of production facilities. No construction activities shall commence without staking of pad construction limits, pad corners, and road/pipeline centerlines and disturbance corridors.

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

3. Drill Cuttings Management. Cuttings generated from the numerous planned well bores shall be worked through a shaker system on the drill rig, mixed with a drying agent, if necessary, and deposited in the planned cuttings trench or piled on location against the cut slope for later burial during the interim reclamation earthwork. The cuttings shall be remediated per COGCC regulations (Table 910-1 standards) prior to earthwork reshaping related to well pad interim reclamation.

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

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

   Culverts at drainage crossings shall be designed and installed to pass a 25-year or greater storm event. On perennial and intermittent streams, culverts shall be designed to allow for passage of aquatic biota. The minimum culvert diameter in any installation for a drainage crossing or road drainage shall be 24 inches. Crossings of drainages deemed to be jurisdictional Waters of the U.S. pursuant to Section 404 of the Clean Water Act may require additional culvert design capacity. Due to the flashy nature of area drainages and anticipated culvert maintenance, the U.S. Army Corps of Engineers (USACE) recommends designing drainage crossings for the 100-year event. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 12.

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

6. Jurisdictional Waters of the U.S. The operator shall obtain appropriate permits from the U.S. Army Corps of Engineers (USACE) prior to discharging fill material into Waters of the U.S. in accordance with Section 404 of the Clean Water Act. Waters of the U.S. are defined in 33 CFR Section 328.3 and may include wetlands as well as perennial, intermittent, and ephemeral streams. Permanent impacts to Waters of the U.S. may require mitigation. Contact the USACE Colorado West Regulatory Branch at 970-243-1199 ext. 12.

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 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 Attachment 1 of the letter provided to operators dated September 9, 2014).

For private surfaces the operator shall use a BLM-approved native seed mix unless specified otherwise by the private landowner.

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.

An exception to these seeding requirements shall be made for seeding of sagebrush. Sagebrush seeding shall occur prior to winter snowfall, or on top of snow. Sagebrush may be sown either by broadcast seeding, or, if not on snowpack, by placing the seed in the fluffy seed box of a seed drill, with the drop tube left open to allow seed to fall out on the ground surface.

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 in project areas within pinyon-juniper, sagebrush shrubland, and/or salt desert shrub habitat types. Mulch may consist of either hydromulch or of certified weed-free straw or certified weed-free native grass hay crimped into the soil. Mulch shall not be used within mountain shrub or spruce-fir forest habitat types, unless requested or approved by the BLM.

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

h. Erosion Control. Cut-and-fill slopes shall be protected against erosion with the use of water bars, lateral furrows, or other BMPs approved by the BLM. Additional BMPs such as biodegradable wattles, weed-free straw bales, or silt fences shall have be employed as necessary to reduce transport of sediments into the drainages. The BLM may, in areas with high erosion potential, require use of hydromulch or biodegradable blankets/matting to ensure adequate protection from slope erosion and offsite transport of sediments and to improve reclamation success.

i. Site Protection. The pad shall be fenced to BLM standards to exclude livestock grazing for the first two growing seasons or until seeded species are firmly established, whichever comes later. The seeded species will be considered firmly established when at least 50 percent of the new plants are producing seed. The BLM will approve the type of fencing.

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

8. Weed Control. The operator shall regularly monitor and promptly control noxious weeds or other undesirable plant species as set forth in the Glenwood Springs Field Office *Noxious and Invasive*

Weed Management Plan for Oil and Gas Operators, dated March 2007. A Pesticide Use Proposal (PUP) must be approved by the BLM prior to the use of herbicides. Annual weed monitoring reports and Pesticide Application Records (PARs), including GPS data in accordance with the February 27, 2014, letter to operators, shall be submitted to BLM by **December 1**.

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

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

11. Raptor Nesting. To protect nesting raptors, a survey shall be conducted prior to construction, drilling, or completion activities that are to begin during the raptor nesting season (February 1 to August 15). The survey shall include all potential nesting habitat within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility. Results of the survey shall be submitted to the BLM. If a raptor nest is located within the buffer widths specified above, a 60-day raptor nesting TL will be applied by the BLM to preclude initiation of construction, drilling, and completion activities during the period of **March 1 to May 1**. The operator is responsible for complying with the MBTA, which prohibits the "take" of birds or of active nests (those containing eggs or young), including nest failure caused by human activity (see COA for Migratory Birds).

12. Migratory Birds – Birds of Conservation Concern. Pursuant to BLM Instruction Memorandum 2008-050, all vegetation removal or surface disturbance in previously undisturbed lands that provide 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.

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

    Where feasible, the operator shall suspend ground-disturbing activities at the discovery site and immediately notify the BLM of any finds. The BLM would, 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.

15. 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 would be subject to prosecution.

    If subsurface cultural values are uncovered during operations, all work in the vicinity of the resource will cease and the Authorized Officer with the BLM notified immediately. The operator shall take any additional measures requested by the BLM to protect discoveries until they can be adequately evaluated by the permitted archaeologist. Within 48 hours of the discovery, the SHPO and consulting parties will be notified of the discovery and consultation will begin to determine an appropriate mitigation measure. BLM in cooperation with the operator will ensure that the discovery is protected from further disturbance until mitigation is completed. Operations may resume at the discovery site upon receipt of written instructions and authorization by the authorized officer.

    Pursuant to 43 CFR 10.4(g), the holder must notify the authorized officer, by telephone, with written confirmation, immediately upon the discovery of human remains, funerary items, sacred objects, or objects of cultural patrimony on Federal land. Further, pursuant to 43 CFR 10.4 (c) and (d), the holder must stop activities in the vicinity of the discovery that could adversely affect the discovery. The holder shall make a reasonable effort to protect the human remains, funerary items, sacred objects, or objects of cultural patrimony for a period of thirty days after written notice is provided to the authorized officer, or until the authorized officer has issued a written notice to proceed, whichever occurs first.

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).

16. 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 existing surrounding vegetation or rock outcrops.

17. Range Management. Range improvements (fences, gates, reservoirs, pipelines, etc.) shall be avoided during development of oil and 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, a steel frame gate(s) or a cattleguard with associated bypass gate shall be installed across the roadway to control grazing livestock.

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

19. Interim Reclamation Related to Drilling Phases. Within 1 year of completion of all exploratory wells proposed on a pad or within one year of completion of all development wells on a pad (whichever the situation may be), the operator shall stabilize the disturbed area by recontouring, mulching, providing run-off and erosion control, replacing topsoil as directed, seeding with BLM-prescribed native seed mixes (or landowner-requested seed mix on a Fee surface), and conducting weed control, as necessary. In cases where the exploratory drilling and development drilling on a single pad occur more than 1 year apart, slopes shall be recontoured to the extent necessary to accommodate seeding, and seed mixes required by the BLM or requested by the private landowner shall be applied to stabilize the soil between visits per direction of the BLM.

20. Existing Rights-of-Way. The operator shall obtain agreements allowing construction with all existing authorized surface users of Federal ROW locations prior to surface disturbance or construction of the

location, staging areas, or access across or adjacent to any existing ROW locations. In the case of privately owned surface, the operator shall certify to BLM that a Surface Use Agreement has been reached with the authorized surface user prior to construction.

PROJECT-SPECIFIC COAS APPLICABLE TO THE FOLLOWING PROJECT COMPONENTS

MV 34-5 Well Pad Expansion

During vegetation clearing for the pad, the few juniper trees and brush along the top of the cutslope shall be cleared, broken down with construction equipment and windrowed at the western or southern edges of the pad perimeter just beyond the topsoil windrow.

The topsoil shall be stripped and placed in a continuous windrow around the pad (with the exception of the eastern pad edge which has a steep drop-off). This perimeter windrow of topsoil shall serve as the primary stormwater control around the pad with catchments installed at the various release points along the pad edges. The topsoil on the north end of the pad shall be windrowed in a manner that keeps the material within the pre-existing disturbance area and away from the active slump area. Topsoil shall also be stripped from the two excess material storage areas and arranged in a series of berms that serve as stormwater catchments for the stockpiles.

Stormwater BMPs shall be used to direct all surface water flow away from the slump areas at the north, east and west sides of the pad. A run-on protection ditch or berm with a sediment trap built at its outlet shall be installed along the top of the west-side cutslope to direct stormwater away from the cutslope and pad working area.

Sediment pond(s) collecting stormwater runoff from the pad shall be constructed at the cut-fill balance points along either side of the pad instead of using black poly pipe to drain sediment catches at the pad corners.

The length of the fillslope shown on the Construction Plat along the east edge of the pad shall be restricted so the toe of the fillslope remains within 10-15 feet of the pad edge. Boulders and rocks generated during the pad construction shall be used to from a wall to contain and hold the east-side fillslope.

The existing wetlands area shown on the Construction Layout (Figure 3) shall be protected from any surface disturbances. The upgradient removal of the 48-inch diameter culvert, downgradient installation of a 96-inch diameter culvert in the pad access road, and construction of the upgradient excess stockpile area could affect the hydrology of the wetland. With the removal of the upgradient 48-inch diameter culvert, the drainage shall be recontoured to natural topography, revegetated with willow cuttings and other native riparian species, and reclaimed.

To minimize erosion and sedimentation, riprap shall be placed at the inlet and outlet of the 96-inch-diameter culvert. Additionally, a sediment trap shall be placed at the 96-inch-diameter culvert outlet. Further, the excess stockpile area upgradient of the wetland shall have an earthen berm to be stabilized with native grasses. A silt fence or other best management practice shall also be installed between the stockpile and the nearest drainage, and runoff from the stockpile shall be routed through a sediment trap.

Any sizable rock or boulders generated during the MV 34-5 pad reconstruction or access road upgrades (and not used for the east-side fill slope containment) shall be collected, stockpiled and used to build a

rock retaining wall at the inlet and/or outlet of the planned 96-inch culvert to be installed in Riley Gulch along the MV 34-5 access road.

Should the period between drilling visits exceed 12 months, interim reclamation of the MV 34-5 pad could be required based on a site review focusing on site stability and proper functioning stormwater structures.

Dozer or grader with chains shall be used as needed to assist heavy truck transports and equipment in gaining ingress and egress to the MV 34-5 pad across the steeper road pitches on the Ant Hill road. Graveling of the existing access road from the MV 28-4 road junction west to the MV 34-5 pad shall be accomplished as directed by the Authorized Officer. Consideration shall be made to delaying the road surfacing on the steeper road pitches until after the rig has moved off the pad.

Should a synthetic-based mud be used for drilling the three horizontal wells, prior sundry approval would be required with consideration that cuttings would be hauled to an approved disposal site. The drilling plan includes the use of a self-contained flare unit to restrict venting

Ant Hill Road Improvements

The new Ant Hill Road Improvements serving the MV 34-5 pad shall be constructed as shown on the Bookcliff Survey Services, Inc. road design package. Culverts shall be installed as shown in the Bookcliff road design package and on the plats attached to the APD.

A series of large diameter culverts would be installed in Riley Gulch near the MV 34-5 pad entrance (96-inch diameter), in a side ravine that feeds Riley Gulch southwest of the MV 34-5 pad (60-inch diameter) and numerous culverts related to the new road segments associated with the Ant Hill Road Work. These new culverts shall be installed and the 48-inch culvert removal shall be completed as shown on the various plats prepared for USACE and APD permitting and as discussed during the BLM/WPX preconstruction meeting.

The new road segments included in the Ant Hill Road Improvement Work, including any interspersed existing road segments, shall be graveled with a minimum 6-inch depth of surfacing as directed by the Authorized Officer.

The proposed road segments shall be staked (centerline and limits of disturbance) prior to the start of road work in a manner that allows adequate review during the pre-construction meeting.

After portions of the Ant Hill Road Work get completed and placed into service, the related existing road segments slated for closure and reclamation shall be completed depending on traffic demands, weather conditions, scheduled rig moves and completion of any related pipeline work. The road closure work shall involve reshaping the road way to natural contours and topography, installing appropriate erosion controls, and conducting final reclamation work including seeding.

It is anticipated that most if not all of the seeding work related to the new Ant Hill Road Work, including the road segments slated for closure, shall require hydroseeding applications for reclamation.

Proposed Pipeline Work

A new 10-inch welded steel natural gas pipeline and 4-inch Flexsteel produced water collection line (both 525 feet in length) shall be buried concurrently in the same trench from a connection point along the main road to the MV 34-5 pad.

The limits of the pipeline disturbance corridors shall generally adhere to the existing disturbance limits of the existing roadway (generally not to exceed 35 feet in width). The new pipelines shall be buried within the existing MV 34-5 access road across the new 96-inch diameter culvert.

After the new MV 15-8 access road segment is constructed from the MV 34-5 pad west, the existing gas and water lines buried in the MV 15-8 access road just uphill from the MV 34-5 pad shall be excavated and buried deeper underneath Riley Gulch to allow this road segment to be closed from use and undergo final reclamation work including reshaping the corridor to natural contour and reseeding to establish desirable vegetation.

With the development of the new MV 15-8 road west of the MV 34-5 pad, the old road crossing at Riley Gulch shall only serve as a reclaimed pipeline corridor. The channel of Riley Gulch shall be re-established with a typical streambank cross-section using rocks and boulders to create a natural stream course. Seeding and transplanting shall be used to establish desirable native vegetation at the pipeline crossing and along the entire reclaimed pipeline corridor. Riparian area reclamation shall consist of cuttings, container stock, and/or seeding with native riparian species, as approved by the BLM botanist.

Prior to installation of the cross-country surface frac lines between the MV 28-4 pad and the MV 34-5 pad, a pre-work meeting will be held with WPX and BLM representatives to discuss the plan to accomplish this task while minimizing impacts to vegetation and existing drainages.

The existing 4-inch pipeline riser located at Ant Hill shall be removed from service and, if needed, shall be reset with the other existing valve risers located southerly near the GM 41-8 turnoff.

The main gas line valve riser shall continue to be operated and accessed by pickup trucks via the existing, but reduced roadway from the north-side of the riser where the existing road nears the new Ant Hill Road realignment at Station 15+00, Riley Gulch Proposed Access Road "A."

BUREAU OF LAND MANAGEMENT

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

DOWNHOLE CONDITIONS OF APPROVAL
Applications for Permit to Drill

Operator:	WPX Energy Rocky Mountain LLC
Lease Number:	COC24603
Pad:	MV 34-5
Engineer:	Bob Hartman
Surface Location:	Garfield County; SESE, Sec. 5, T7S, R96W

See list of wells following the COAs.

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

2. A CRVFO petroleum engineer shall be contacted for a verbal approval prior to commencing remedial work, plugging operations on newly drilled boreholes, changes within the drilling plan, sidetracks, changes or variances to the BOPE, deviating from conditions of approval, and conducting other operations not specified within the APD. Contact the petroleum engineer 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, the petroleum engineer shall be notified within 24 hours from the time of the event. IADC/Driller's Logs and Pason Logs (mud logs) shall be forwarded to CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652 within 24 hours of a well control event.

4. The BOPE shall be tested and conform to Onshore Order No. 2 for a **3M** system and recorded in the IADC/Driller's log. A casing head rated to 30,000 psi or greater shall be used.

5. Flexible choke lines shall meet or exceed the API SPEC 16C requirements. Flexible choke lines shall have flanged connections and configured to the manufacturer's specifications. The flexible choke lines shall be anchored in a safe and workmanlike manner. At minimum, all connections shall be effectively anchored in place for safety of the personal on location. 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. The results from the test shall be submitted via email to the petroleum engineer on the first well drilled on the pad or any horizontal well and the results shall be recorded in the IADC log. A failed pressure integrity test has more than a 10% pressure bleed off in 15 minutes. A failed test shall be reported to the petroleum engineer.

10. As a minimum, cement shall be brought to 200 feet above the Mesaverde Group. 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. The top of cement on the first cement job on the pad (Temperature Log) shall be evaluated. If the cement is below the 200-foot cement coverage requirement, the cement volume shall be adjusted 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 the surface and from the TD to the bottom of the surface casing shoe. This log shall be submitted within 48 hours in .las and .pdf format to: CRVFO – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652. Call 970-876-9000 for clarification.

12. Within 30 days of completed operations (i.e. landing tubing) per 43 CRF 3160-9 (a), the following shall be submitted: (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.

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, the petroleum engineer 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, the bradenhead/casing head pressures shall be monitored 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. The petroleum engineer shall be notified immediately.

Contact Information

Colorado River Valley Field Office
Petroleum Engineer

Office: (970) 876-9000
CRVFO_PE@blm.gov

Bob Hartman
Petroleum Engineer

Office: (970) 244-3041
Cell: (970) 589-6735
bhartman@blm.gov

Proposed Pad	*Proposed Well*	*Surface Location (T7S R96W)*	*Bottom Hole Location (T7S R96W)*
MV 34-5 (BLM Surface)	34-5	Sect. 5, SESE	Section 5, SWSE
MV 34-5 (BLM Surface)	43-5	Sect. 5, SESE	Section 5, NESE
MV 34-5 (BLM Surface)	333-5	Sect. 5, SESE	Section 5, NWSE
MV 34-5 (BLM Surface)	334-5	Sect. 5, SESE	Section 5, SWSE
MV 34-5 (BLM Surface)	343-5	Sect. 5, SESE	Section 5, NESE
MV 34-5 (BLM Surface)	433-5	Sect. 5, SESE	Section 5, NWSE
MV 34-5 (BLM Surface)	434-5	Sect. 5, SESE	Section 5, SWSE
MV 34-5 (BLM Surface)	443-5	Sect. 5, SESE	Section 5, NESE
MV 34-5 (BLM Surface)	533-5	Sect. 5, SESE	Section 5, NWSE

BUREAU OF LAND MANAGEMENT

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DOWNHOLE CONDITIONS OF APPROVAL
Applications for Permit to Drill

Operator:	WPX Energy Rocky Mountain LLC
Lease Number:	COC24603
Pad:	MV 34-5 Mancos Completions
Engineer:	Bob Hartman
Surface Location:	Garfield County; SESE, Sec. 5, T7S, R96W

See list of wells following the COAs.

1. **The proposed horizontal wellbore crosses lease lines therefore a communitization agreement (CA) must be created prior to completion or production operations. Please contact Laura Millard at 970-876-9060 with any questions related to CAs.**

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

3. 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 the petroleum engineer for verbal approvals (contact information below).

4. 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, the petroleum engineer 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.

5. The BOPE shall be tested and conform to Onshore Order No. 2 for a **10M** system and recorded in the IADC/Driller's log. A casing head rated to 30,000 psi or greater shall be used.

6. Flexible choke lines shall meet or exceed the API SPEC 16C requirements. Flexible choke lines shall have flanged connections and configured to the manufacturer's specifications. The flexible choke lines shall be anchored in a safe and workmanlike manner. At minimum, all connections shall be effectively anchored in place for safety of the personal on location. 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.

7. 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.

8. 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.

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10. 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 to the petroleum engineer on the first well drilled on the pad or any horizontal well and record results in the IADC log. A failed pressure integrity test is more than 10% pressure bleed off in 15 minutes. Report failed test to the petroleum engineer.

11. 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.

12. 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 – Petroleum Engineer, 2300 River Frontage Road, Silt, CO 81652. Contact 970-876-9000 for clarification.

13. 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).

14. 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, the petroleum engineer 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.

15. 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 the petroleum engineer immediately.

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Proposed Pad	***Proposed Well***	***Surface Location***	***Bottom Hole Location***
MV 34-5 (BLM Surface)	GM 705-34-8 HN1	T7S R96W, Sect. 5, SE SE	Section 8, SWSE
	GM 705-34-8 HN2		Section 8, SWSE
	GM 705-44-8 HN1		Section 8, SESE

FONSI
DOI-BLM-CO-N040-2014-0100-EA

The Environmental Assessment (EA) analyzing the environmental effects of the Proposed Action, including nine new Federal directional wells and three new Federal horizontal wells to the existing MV 34-5 well pad and associated access road improvements, has been reviewed. The project design and approved mitigation measures result in a Finding of No Significant Impact (FONSI) on the human environment. Therefore, an Environmental Impact Statement (EIS) is not necessary to further analyze the environmental effects of the Proposed Action.

DECISION RECORD

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

RATIONALE: The bases for this decision are as follows:

1. Approval of the Proposed Action is validating the rights granted with the Federal oil and gas leases to develop the leasehold to provide commercial commodities of oil and gas.
2. The environmental impacts would be avoided, minimized, or offset with the mitigation measures incorporated into the Proposed Action or attached and enforced by the BLM as Conditions of Approval (COAs).
3. This Decision does not authorize the initiation of surface-disturbing activities on BLM lands or of drilling activities associated with any Federal oil and gas well. Initiation of activities related to the new Federal oil and gas wells to be added to the existing well pad may commence only upon approval by the BLM of the Application for Permit to Drill (APD). Similarly, initiation of activities related to access road improvements may commence only upon approval of an amendment to BLM Right-of-Way grant (COC67026).

MITIGATION MEASURES: Mitigation measures presented in the Appendix of the EA will be incorporated as COAs for both surface and drilling operations and attached to APDs for Federal wells on the MV 34-5 well pad and as stipulations for the ROW amendment.

NAME OF PREPARER: Jim Byers, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:

Allen B Crockett

DATE: 12/22/14

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