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-N040-2014-0014-EA

CASEFILE NUMBER

Federal Oil and Gas Lease COC27868; BLM Site Right-of-Way COC76427.

PROJECT NAME

Proposal to Dispose Produced Water into Pore Space of Federal Minerals from New Water Disposal Well Located and Drilled on Private Land Northeast of Rulison, Garfield County, Colorado, Authorized by BLM Right-of-Way.

PROJECT LOCATION

Water Disposal into Pore Space within Federal Lease: Township 6 South (T6S), Range 94 West (R94W), Section 19, Lot 12, Sixth Principal Meridian. The project is located approximately 1 air-mile northeast of Rulison, Colorado (Exit 81 on (Interstate 70) and is accessed by Garfield County Road 246 (CR 246), which provides access to the Garfield County Landfill (Figure 1). Elevation at the surface location for the proposed fee disposal well is 5,500 feet above mean sea level (MSL).

APPLICANT

WPX Energy Rocky Mountain LLC. Contact: Bryan Hotard, 1058 County Road 215, Parachute, CO 81635.

BACKGROUND

To develop an alternate source of disposing produced water generated from oil and gas development activities in the area, WPX Energy Rocky Mountain LLC ("WPX") proposes to directionally drill a new water disposal well on fee surface and dispose produced water into the bedrock interstices (pore space) of Federal fluid mineral lease COC27868. Since the well would be drilled from the existing RMV 205-20 well pad on fee surface with underlying fee minerals, Colorado Oil and Gas Conservation Commission (COGCC) has the permitting authority for the construction, drilling and completion operations associated with the Application for Permit to Drill (APD) for the new wellbore. BLM, however, does have permitting authority under the Federal Land Policy Management Act of 1976 (FLPMA) to issue a right-of-way (ROW) to WPX to authorize the disposal of produced waters into the Federal pore space of the oil and gas lease held by WPX. BLM will also review the drilling program in the state APD to ensure that Federal fluid minerals are adequately protected for continued lease development in the future.

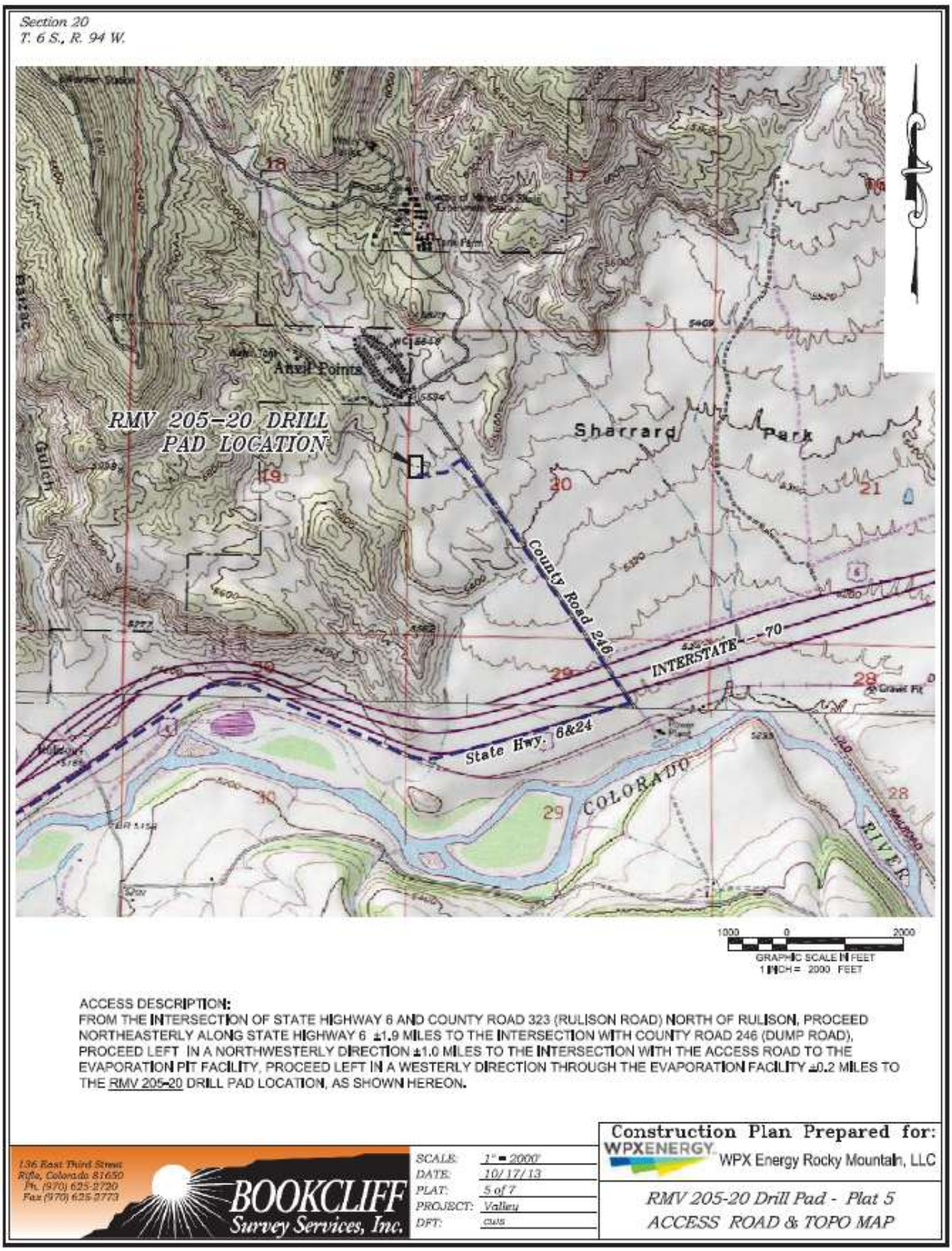


Figure 1. Project Location Map

Because the project site is located on private lands and does not involve the extraction of Federal fluid minerals, the Federal nexus for this Environmental Assessment (EA) is the disposal of produced waters within a Federal oil and gas lease. Consequently, this EA focuses primarily on the potential impacts associated with disposal of produced water into pore space of the Federal lease. In addition, the EA addresses potential adverse impacts to Federally protected surface resources from drilling and operation of the well. If approved, the use of the Federal lease for this purposed would be authorized by a right-of-way (ROW) grant. Approval of other aspects of drilling and operating the water disposal well *per se* are within the sole purview of COGCC.

ALTERNATIVES

Proposed Action

The proposed RWF 933-19D water disposal well would be drilled from the existing RMV 205-20 well pad located adjacent to WPX's Rulison Centralized Water Treatment Facility on private surface with underlying fee minerals (Figure 2). The wellbore would be directionally drilled into the pore space of Federal minerals in the nearby Federal oil and gas lease COC27868 in an adjoining section (Figure 3). BLM's roles in this project are to (1) analyze the actions connected with disposing saltwater into the Federal pore space, recognizing the protections provided in pertinent Federal statutes, and (2) issue a ROW grant listing stipulations to mitigate the impacts of disposing those produced waters.

The ROW grant (COC76427), to be issued under FLPMA authority if the project is approved, would include a provision requiring annual payment for the disposed fluids, measured in barrels and based on an itemized report submitted to the BLM no later than October 15 of each year of disposal operations. Metering equipment would be installed at the wellhead or located on the RMV 205-20 pad to measure the volume of disposed water through the wellbore. The water disposal well, to be operated year-round, is anticipated to have the same active life as the oil and gas wells that are the source of the produced water. The saltwater to be disposed into Federal pore space would be generated from both Federal and private wells operated by WPX.

Drill and completing the water disposal well would be authorized by COGCC through approval of an Application for Permit to Drill (APD) submitted by WPX. Approval of this APD would also authorize reconstruction and expansion of the private RMV 205-20 pad, resulting in 2.97 acres of new disturbance and a total footprint of 3.72 acres. To deliver produced water from the adjacent water treatment facility and/or WPX's buried water collection pipeline system, a new 4-inch-diameter water supply line would be buried within an existing pipeline corridor or the existing footprint of the water treatment facility (Figure 2). All of the surface disturbance related to the pad reconstruction, water line installation, and disposal well drilling would occur on private land.

The COGCC, the permitting agency in Colorado for water disposal wells (termed Underground Injection Conversion or "UIC" wells by that agency), is undertaking that permit review for the disposal well. An aquifer exemption request has been reviewed and would be granted by the U.S. Environmental Protection Agency (USEPA), Colorado Department of Public Health and Environment (CDPHE), and COGCC as part of the State's UIC permitting process. BLM has been involved in review of the state APD to ensure that protection of the Federal fluid minerals would be incorporated by COGCC and implemented by WPX.

A biological survey for this project conducted by WestWater Engineering on September 5, 2013, included the RMV 205-20 pad site and the proposed water line alignment. The project area includes potential habitat for Colorado hookless cactus (*Sclerocactus glaucus*) and DeBeque milkvetch (*Astragalus*

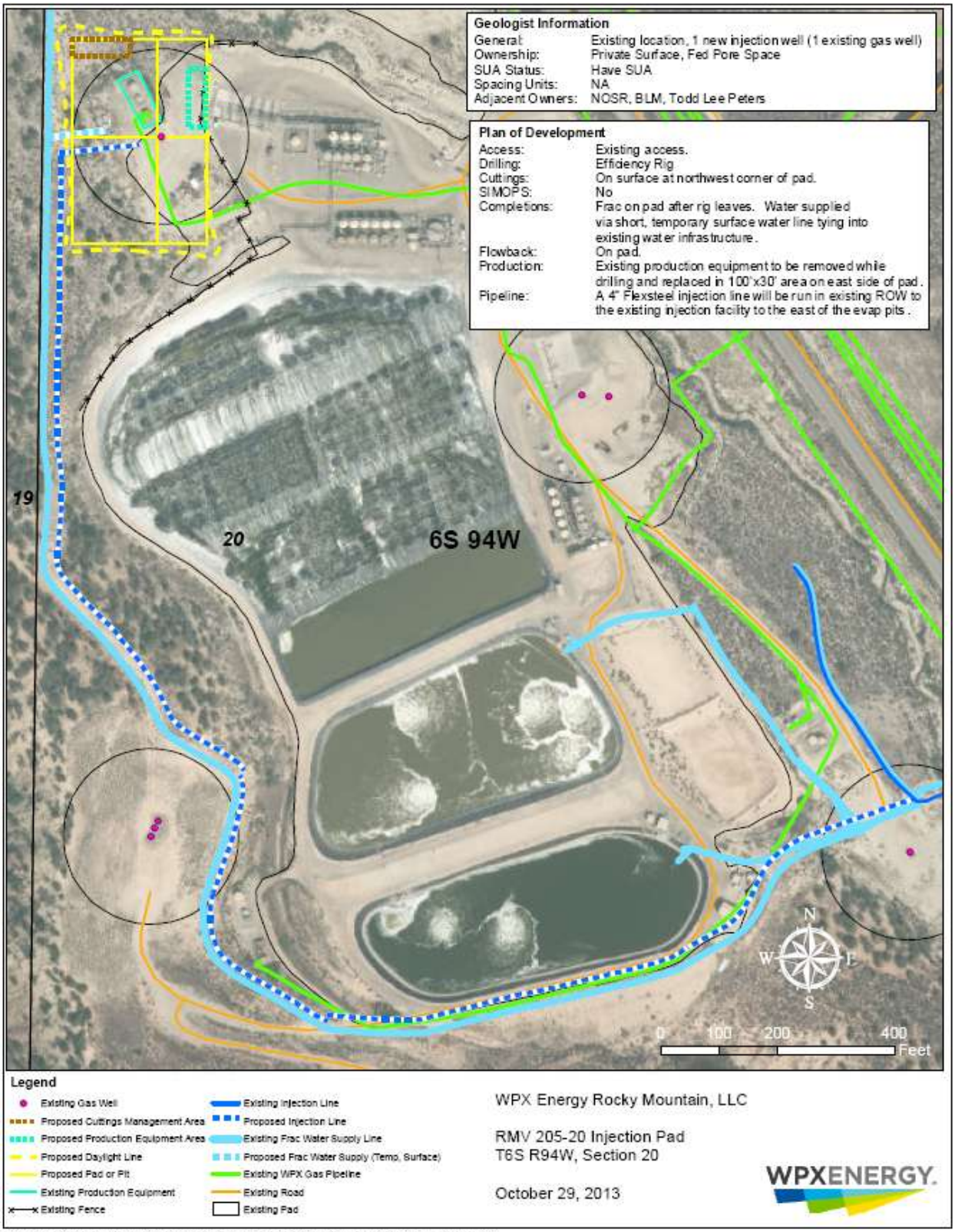


Figure 2. Plan of Development showing Private Surface Facilities

debequaeus), although neither of these species was observed. Noxious weeds were also inventoried, with cheatgrass (*Anisantha tectorum*) and halogeton (*Halogeton glomeratus*) found to be widespread across the project area. A raptor survey conducted in February 2014 resulted in no sightings of raptors or nest sites in proximity to the project. A cultural survey was conducted by Grand River Institute in Fall 2013. Cultural resource monitoring would be conducted during the water line installation to protect potentially eligible sites.

The Proposed Action would be implemented consistent with the Federal oil and gas lease, Federal regulations (43 CFR 2800), and the operational measures included in the ROW permit. Appendix A provides a list of stipulations attached to ROW grant COC76427 as conditions for issuance by the BLM.

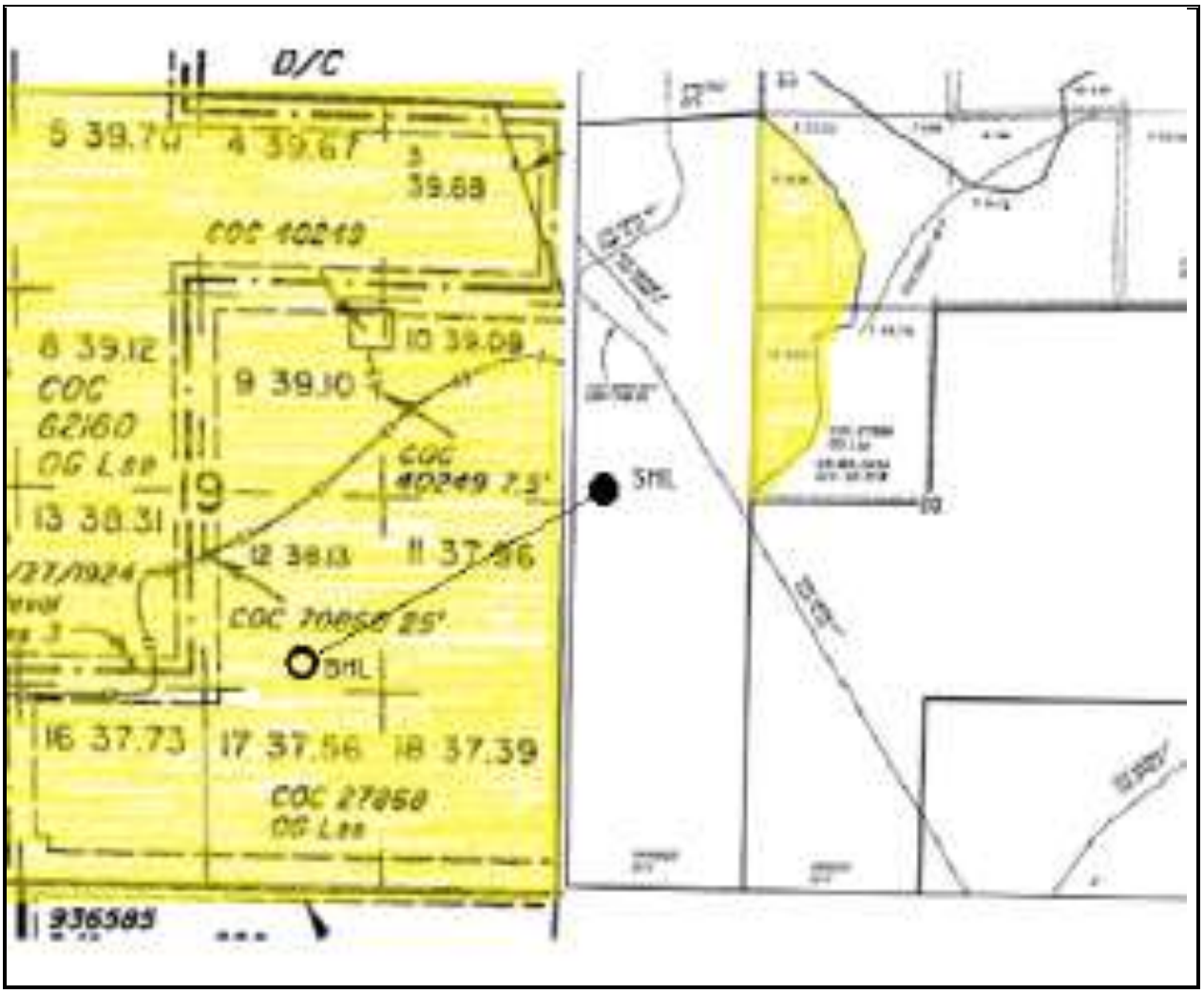


Figure 3. Depiction of Water Disposal Well
The Surface Hole Location (SHL) on private land (shown in white) in Section 20 and its relationship with the Bottomhole Location (BHL) in Pore Space of Federal Minerals (shown in yellow) in Lot 12, Section 19, T6S R94W, 6th P.M.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant. Such denial would preclude use of the pore space of Federal lease COC27868 for the disposal of saline waters produced off-lease from Federal and private oil and gas wells. Since no produced water would be disposed into Federal pore-space, annual receipts from the disposed volume would not be generated.

PURPOSE AND NEED FOR THE ACTION

Although the primary purpose of the water disposal well is to allow produced water to be disposed into the pore space of Federal minerals, the action would not override or be inconsistent with WPX's Federal lease rights. The disposal of saltwater would occur outside gas-producing zones within the Federal oil and gas lease. Additionally, the disposal of saltwater produced from Federal and private oil and gas wells operated by WPX provides the operator an alternative source for the disposition of the produced fluids. A BLM site ROW is the authorizing document for this action.

PLAN CONFORMANCE REVIEW

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

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

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

Furthermore, the 1999 Draft EIS included the following language at Appendix A, page 11: "In addition to roads [and] other surface uses for development, drilling may include flow lines; storage tank batteries; facilities to separate oil, gas, and water (separators and treaters); and injection wells for saltwater disposal. Some of the facilities may be installed at each producing well site, and others at places situated to serve several wells."

Discussion: The Proposed Action is in conformance with the 1991 and 1999 RMP amendments cited above because the Federal mineral estate proposed for development was designated as open to oil and gas leasing and development, and Federal lease COC27868 was duly leased pursuant hereto. The proposed project is of a type specifically contemplated and analyzed in the 1999 RMP amendment and is in conformance because the stipulations specified in the 1999 RMP amendment were attached to the lease and incorporated into project design. Furthermore, the project lies within the boundary of the Wheeler to Webster Mesa Geographic Area Plan (2005 WW GAP) approved in 2005. The Proposed Action is therefore in conformance with the current land use plan

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

During internal scoping, the BLM interdisciplinary (ID) team identified the following as potentially affected by operations associated with disposing saltwater from Federal and private oil and gas wells into Federal pore space: geologic resources, invasive non-native plants, Native American religious concerns, special status plants, water quality – groundwater, and wildlife – migratory birds.

Cultural Resources

Affected Environment

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

Two Class III (intensive pedestrian survey) cultural resource inventories (CRVFO# 9801-1 and 1107-21) have been conducted previously within portions of the proposed project area for a variety of oil and gas related well pads, access roads, and/or pipelines. In addition, a third inventory (CRVFO# 1114-3) by Grand River Institute was conducted specifically for this project and covered the pad area and waterline corridor. The cultural inventories and pre-field file searches of the Colorado SHPO database and BLM Colorado River Valley Field Office cultural records identified no historic properties within the project Area of Potential Effect (APE). Four historic properties (sites 5GF.5033, 5GF.5034, 5GF.5035 and 5GF.5036) are in the project vicinity, but outside the APE. Eligible or potentially eligible cultural sites are referred to in Section 106 of the National Historic Preservation Act as "historic properties."

Environmental Consequences

Proposed Action

No historic properties have been identified within the proposed project APE. Therefore, the BLM has made a determination of "**No Historic Properties Affected**." This determination was made in accordance with the 2001 revised regulations [36CFR 800.4(d)(1)] for Section 106 of the National Historic Preservation Act (16U.S.C 470f), the BLM/State Historic Preservation Officer (SHPO) Programmatic Agreement and Colorado Protocol]. As the BLM has determined that the Proposed Action would have no direct impacts to known "historic properties," no formal consultation was initiated with the SHPO. Although outside the project APE, two eligible sites (5GF5035 and 5GF5036) are within the area inventoried for the project. Monitoring is recommended near these sites during waterline installation to determine if any subsurface components of these sites might be revealed.

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

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

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. This would result in no new impacts to cultural resources.

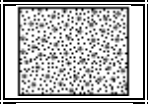
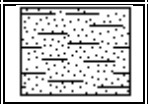
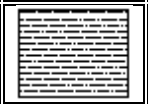
Geologic Resources

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 1 lists the geologic formations within the project area.

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

Table 1. Geologic Surface Formations within the Study Area

Map Symbol	***Lithologic Pattern***	***Formation Name***	***Age***	***Characteristics***	***Location***
Qal		Local Alluvium	Pleistocene	Unconsolidated , poorly sorted valley fill	Found in the Sharrard Park area near Anvil Points
Qp		Pediment Gravel deposits.	Pleistocene	Angular to sun-rounded pebble and cobble gravel.	North of Colorado River – mantles slopes and ridges..
Tga		Anvil Points Member Green River Formation	Eocene	Coarse-grained, gray and brown sandstone.	Outcrops and cliff faces.
Tw		Wasatch Formation	Eocene/ Paleocene	Variegated purple, lavender, red gray and brown claystone.	Steep slopes and outcrops.
Source: O'Sullivan. 1986					

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

The Iles Formation of the Mesaverde Group is the target zone of the proposed drilling and injection 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. The Iles Formation overlies the marine Mancos Shale, and includes three regressive marine sandstone cycles that are separated by tongues of the marine Mancos Shale. The basal sequence of each shale tongue represents the transgressive phase of each marine cycle. These regressive cycles are, in ascending order, the Corcoran, the Cozzette, and the Rollins members, these sandstones are laterally continuous and can be correlated across much of the southern and eastern Piceance Basin (Cumella and Ostby 2003).

The Corcoran Member can be traced eastward from Big Salt Wash, Colorado, to where it pinches out into the Mancos Shale several miles southeast of the town of Palisade. The formation averages a thickness of 100 feet and consists of very fine grained to fine-grained sandstone, siltstone, shale, and coal. Tongues of Mancos shale separate the Corcoran from the underlying Sego Sandstone and overlying Cozzette Member. The Cozzette has been mapped from Hunter Canyon to 10 miles west of the town of Paonia Colorado. The Cozzette averages a thickness of 250 feet and contains strata similar in constitutes to the Corcoran. Both the Corcoran and the Cozzette display gradational contact with underlying shale tongues and a sharp contact with overlying tongues (USGS 2002).

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

Two potential concerns affecting geology and minerals are tied to the development of this project. First is the loss of viable mineral resources, and their associated royalties. Second is the propagation of injected fluids into existing fault zones, possibly inducing subsequent seismic activity.

Although producing Iles Formation wells are located within the Piceance Basin, development history has shown to be more active south and east of the town of Parachute, Colorado, notably in the Mamm Creek field. Seismic data and abundant well control indicate early movement of Laramide structures, which affected deposition of Iles and Williams Fork strata. The shoreline orientation and the amount of stratigraphic rise change dramatically from the Corcoran and Cozzette regressions to that of the Rollins. A major stratigraphic rise of the Rollins between Rulison and Mamm Creek fields can be correlated to a Laramide fault identified on seismic data (Cumella and Ostby 2003). Both Corcoran and Cozzette development depend on stratigraphic traps, and geologic structures (anticlines, large-scale fractures, etc.) in order to be economically viable, none of which has been identified in the project area. Based on this analysis, losses of mineral resources are not expected.

The increased permeability and porosity of both lower members of the Iles formation causes some concern over the propagation of injected fluids into adjacent fault zones. A growing body of evidence suggests that fluids are intimately linked to a variety of faulting processes. These include the long-term structural and compositional evolution of fault zones; fault creep; and the nucleation, propagation, arrest and recurrence of earthquake ruptures. Besides the widely recognized physical role of fluid pressures in controlling the strength of crustal fault zones, it is also apparent that fluids can exert mechanical influence through a variety of chemical effects (Hickman, Sibson, and Bruhn 1995).

Regional fractures in the Rocky Mountain basins are most commonly mineralized with layers or patches of an early phase of quartz and a later phase of calcite. An even later phase of kaolinite is also present

locally. The different mineralization phases record changing conditions of mineral stability during subsidence, burial, and uplift. (Lorenz 2003). Quartz represents stability due to high temperatures and pressures at maximum burial, while calcite is more soluble and precipitated during cooling related to uplift, kaolinite is generally representative of waters introduced along faults. Of the minerals associated with fractures, kaolinite is the least stable and is indicative of recent seismic events, exemplifying the link of fluids and fault propagation.

The location of the RWF 933-19D was selected based on three criteria: 1) its bottomhole location is greater than 0.5 mile from any previously identified fault zones; 2) the low production and subsequent abandonment of both Corcoran and Cozzette wells within the vicinity; and 3) the surface location's adjacency to WPX's pre-existing water treatment facility, which is the source of the water to be disposed using this well. Using this criterion, it is unlikely that the RWF 933-19 will have any substantial impacts on geology or minerals as long as injection rates and volumes are kept with the constraints of the permit.

Hydraulic fracturing would be utilized to create fractures within the formation to allow for injection of produced water. 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 Quality-Groundwater.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. This would result in no new impacts to geologic resources.

Invasive Non-Native Plants

Affected Environment

Plants designated as noxious weeds by the Colorado Department of Agriculture are regulated under the Colorado Noxious Weed Act, Title 35, Article 5.5. The Colorado noxious weed list includes three categories, based on existing infestation levels and a tiered approach to weed management. These are as follows: List A species – targeted for eradication; List B species – targeted for containment to limit spread; and List C species – targeted for integrated weed management including biocontrols, additional education resources, and research.

Botanical surveys conducted on September 5, 2013, identified state-listed noxious weeds within and surrounding the project area, as well as other non-native plant species that can also have detrimental impacts on native plant communities (WWE 2013). The proposed water disposal well would be drilled and operated on an existing well pad located on private surface underlain by private mineral estate. The project area lies within pinyon-juniper woodland and salt desert shrub habitat types, at an elevation of approximately 5,500 feet.

Surveys documented four State List B species primarily within shallow drainage areas around the existing well pads: Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), plumeless thistle (*Carduus acanthoides*), and tamarisk (*Tamarix* sp.). Surveys also found three State List C species present within the project area. Common burdock (*Arctium minus*) occurs primarily within adjacent drainages, while

cheatgrass (*Bromus tectorum*) and halogeton (*Halogeton glomeratus*) are common and widespread throughout the project area.

Several other species not listed as noxious weeds but problematic non-native invasive species are also common and widespread across the site. These include bur buttercup (*Ceratocephala testiculata*), kochia (*Bassia scoparia*), madwort (*Alyssum* sp.), Russian-thistle (*Salsola tragus*), and tall tumble mustard (*Sisymbrium altissimum*). In addition, several non-native species are present in the previously reclaimed area adjacent to the existing pad. These include cereal rye (*Secale cereale*), crested wheatgrass (*Agropyron cristatum*), and smooth brome (*Bromus inermis*). These species have been widely used in dryland pastures and in reclamation of disturbed sites but can expand beyond seeded areas, persist indefinitely and resist control efforts, and impede or prevent establishment of native species (Jordan et. al. 2008, Grant-Hoffman et. al. 2012).

Environmental Consequences

Proposed Action

Under the Proposed Action, no new ground disturbance would occur except in previously disturbed areas. However, increased vehicle traffic associated with well drilling and water disposal would increase the potential for introduction of invasive species, as well as the risk of spreading the noxious weeds already present at the site. Disturbed areas, such as roads and well pads, provide a niche for invasion and establishment of non-native plant species particularly when these species are already present in the surrounding area. The mechanisms for this invasion and establishment are multi-fold. Soil disturbance and removal of native vegetation creates 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). Construction equipment and heavy vehicles often transport invasive plant seeds alone or in dirt clods on tires or the vehicle undercarriage (Schmidt 1989, Zwaenepoel et. al. 2006).

Noxious weeds and other invasive species are well adapted to colonize and dominate in disturbed ground. They generally do not require well-developed soils, can out-compete native species for resources, produce prodigious quantities of seeds, and have seeds which can survive for many years or even decades within the soil. When weeds establish on a site, they can also significantly alter the composition of the soil microbial community of bacteria and fungi, making it increasingly more difficult over time for native species to reestablish on the site (Hierro et. al. 2006, Reinhart and Callaway 2006, Vinton and Goergen 2006, Jordan et. al. 2008, Vogelsgang and Bever 2009). Some weed species produce defensive chemicals which can impede germination of native plant seeds, as well as germination of spores for mycorrhizal fungi species upon which most perennial native plants are dependent (Bainard et. al. 2009). Due to the quantity and longevity of weed seeds and the effects of weeds on the soil, once these invasive species have established on a site they can be extremely difficult to eliminate.

These noxious weeds and other invasive non-native plants already exist at the project site. The installation of a new water disposal well would contribute a small incremental increase in to the existing noxious weed risks and concerns at this site.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and

operation of the water disposal well as proposed by WPX. This would result in no new impacts associated with invasive non-native plants.

Native American Religious Concerns

Affected Environment

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

Environmental Consequences

Proposed Action

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

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

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

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

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal

minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. This would result in no new impacts to Native American religious concerns.

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 2 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. The proposed project lies within the habitat range of two of these species, Colorado hookless cactus and DeBeque phacelia. However, suitable habitat is present only for Colorado hookless cactus.

Table 2. 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	No	No
DeBeque phacelia *(Phacelia submutica)* – Threatened	Sparsely vegetated, steep slopes in chocolate-brown, gray, or red clay on Atwell Gulch and Shire Members, Wasatch Formation; 4,700 to 6,200 feet	Desert shrubland with four wing saltbush, shadscale, greasewood, broom snakeweed, bottlebrush squirreltail and Indian ricegrass, grading upward into scattered junipers	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-elder, cottonwoods, willows, and herbaceous riparian graminoids and forbs.	No	No

Botanical surveys were conducted on September 5, 2013. Although suitable habitat was present, no Colorado hookless cactus plants were found. No suitable habitat was found for any other Federally listed plant species (WWE 2013).

Environmental Consequences

Proposed Action

Because there are no known Colorado hookless cactus plants within 100 meters of any ground-disturbing activities, the proposed project would have "**No Effect**" on Colorado hookless cactus. Because no suitable habitat is present for DeBeque phacelia, Parachute penstemon, or Ute lady's-tresses orchids within 100 meters of any proposed ground-disturbing activities, the proposed project would have "**No Effect**" on these species.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. For this reason, and because there are no Federally listed plants in or near the project area, the effects determination would be the same as for the Proposed Action, and the No Action Alternative would have **"No Effect"** on Federally listed plants.

BLM Sensitive Plant Species

Affected Environment

BLM sensitive plant species with habitat and/or occurrence records in Garfield County are listed in Table 3, along with summaries of their habitat requirements, potential for occurrence within the project area, and potential to be impacted by the Proposed Action. Only one species, DeBeque milkvetch, has the potential to occur within the proposed project area. Rare plant surveys were conducted within the proposed project area on September 5, 2013. No DeBeque milkvetch plants were found within 50 meters of the project area (WWE 2013).

Table 3. Potential for Occurrence of BLM Sensitive Plant Species

Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
DeBeque milkvetch (*Astragalus debequaeus*)	Varicolored, fine-textured, seleniferous or saline soils of Wasatch Formation; 5,100 to 6,400 feet	Pinyon-juniper woodlands and desert shrub.	Yes	No
Naturita milkvetch (*Astragalus naturitensis*)	Sandstone mesas, ledges, crevices and slopes in pinyon/juniper woodlands; 5,000 to 7,000 feet	Pinyon-juniper woodlands	No	No
Piceance bladderpod (*Lesquerella parviflora*)	Shale outcrops of the Green River Formation, on ledges and slopes of canyons in open areas; 6,200 to 8,600 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No

Table 3. Potential for Occurrence of BLM Sensitive Plant Species				
Species and Status	***Occurrence***	***Habitat Association***	***Range or Habitat in Vicinity?***	***Potentially Affected?***
Roan Cliffs blazing-star (*Mentzelia rhizomata*)	Steep, eroding talus slopes of shale, Green River Formation; 5,800 to 9,000 feet	Pinyon-juniper woodlands, shrublands; often with other oil shale endemic species	No	No
Harrington's beardtongue (*Penstemon harringtonii*)	Flats to hillsides with rocky loam and rocky clay loam soils derived from coarse calcareous parent materials or basalt; 6,200 to 9,200 feet	Sagebrush shrublands, typically with scattered pinyon-juniper	No	No
Cathedral Bluffs meadow-rue (*Thalictrum heliophilum*)	Endemic on sparsely vegetated, steep shale talus slopes of the Green River Formation; 6,300 to 8,800 feet	Pinyon-juniper woodlands and shrublands; often with other oil shale endemics, sometimes with rabbitbrush or snowberry	No	No

Environmental Consequences

Proposed Action

Because there are no known occurrences of any BLM sensitive plant species in or adjacent to the project area, the Proposed Action would not adversely affect any BLM sensitive plants.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. For this reason, and because no occurrences of BLM sensitive plants are known in the area, this alternative would have no impact on these species.

Water Quality -- Groundwater

Affected Environment

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

The principal bedrock aquifers of the Piceance Basin are the Uinta Formation and the Parachute Creek Member of the Green River Formation, and are defined as the upper and lower Piceance Basin aquifer systems. The Uinta Formation consists of discontinuous layers of sandstone, siltstone, and marlstone and is less permeable than the hydrologically connected upper Parachute Creek Member (Robson and Saulnier 1981). The uppermost Uinta Formation also contains a shallow, perched aquifer that is separate from the upper aquifer unit (Cole et al. 1995). The upper Piceance Basin aquifer is underlain by the Mahogany confining unit, and correlates with the Mahogany Zone, the principal oil shale unit of the Piceance Basin. The Mahogany Zone separates the upper aquifer from the lower. The lower aquifer consists of the fractured marlstone of the lower part of the Parachute Creek Member.

The thickness of the upper and lower aquifer units average 700 and 900 feet, respectively (CGS 2003). Both upper and lower aquifer systems are found within the surrounding cliffs of the project area, but no water wells are completed within either the upper or lower bedrock aquifers units as described above. Beneath these two aquifer systems is a confining unit consisting of the Wasatch Formation and the lower two members of the overlying Green River Formation. Some fresh-water wells are completed in localized water-bearing intervals within this unit. Below the Wasatch Formation is the Cretaceous-aged Mesaverde aquifer. The depth to the top of this aquifer beneath the project area is more than 5,000 feet below ground surface (bgs), far too deep for economic development. The Mesaverde aquifer is of regional importance, but does not provide recharge into the fresh water system within the shallower groundwater system of the area.

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

According to the CDWR database, two permitted water wells are located within 0.5 mile of the project site, both of which show a status of “abandoned.”

<u>Environmental Consequences</u>

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. However, contamination would most likely occur from fluid spills or faulty cementing programs rather than fluid migration, due to the depth of the injection intervals of approximately 8,000 feet below ground surface (bgs). Hydraulic fracturing would be incorporated to create additional pathways to facilitate gas production. Agents called “proppants” used to prop open the fractures are mixed with both fresh water and produced water. Typical proppants include sand, aluminum, glass, or plastic beads, with less than 1% of other compounds such as for reducing friction and corrosion and inhibiting the development of scale (EnerMax Inc. 2007). Fracing techniques are used to create secondary porosity fractures, held open by proppants, allowing the otherwise trapped gas to migrate up the borehole for production.

Hydraulic fracturing would be conducted at 5,000 feet or more bgs. Drilling scenarios are developed to prevent fluids and produced hydrocarbons from migrating upward into fresh water zones. 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.

Potential Impacts of Hydraulic Fracturing During Oil and Gas Well Completions

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

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

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

The potential height of hydraulically induced fractures in horizontal drilling is reduced in layered sediments in which a propagating fracture encounters a change in rock type or a bedding plane within a formation or a contact between formations. When these features are encountered, the fracture either terminates or to a lesser extent reorients along the generally horizontal bedding plane or formation contact instead of continuing upward across it. In the CRVFO area, natural gas production is primarily from vertically stacked, lenticular tight sands of the Mesaverde formation using vertical and directional

wells. These tight-sand lenses are a few tens of feet thick or less. More recently, advances in horizontal drilling technology have allowed enhanced development of deeper marine shales such as the Niobrara formation. These tight-shale deposits are a few hundreds to thousands of feet thick in the CRVFO area compared to many hundreds or thousands of feet in some other gas-producing regions. The thickness of hydrocarbon-bearing strata in this area limits the vertical growth of primary and secondary fractures resulting from hydraulic stimulation.

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

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

No single list of chemicals currently used in hydraulic fracturing exists for western Colorado, and the exact combinations and ratios used by operators are considered proprietary. However, the general types of compounds and relative amounts used are well known and relatively consistent (Table 4). Since fracture jobs are tailored to the downhole environment and companies are aware of the concerns involving hydraulic fracturing, the chemicals listed in Table 4 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 4 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 4. The sand is as a proppant, or propping agent, to help keep the newly formed fractures from closing.

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

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

Table 4 Constituents of Typical Hydraulic Fracturing Operation in Tight Gas Formations

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

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

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. This would result in no new impacts to groundwater.

Wildlife – Migratory Birds

Affected Environment

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

Emphasizing the need to conserve declining migratory bird species, the U.S. Fish and Wildlife Service (USFWS 2008) has published a list of Birds of Conservation Concern (BCC). This section focuses on BCC species, non-BCC species that are Neotropical (long-distance) migrants, and raptors—three groups especially vulnerable to habitat loss or modification on their breeding grounds. Species protected under the Endangered Species Act or classified by the BLM as sensitive species are addressed in the section on Special Status Species.

The current BCC list includes 11 species potentially present in or near the project area: the bald eagle (*Haliaeetus leucocephalus*), golden eagle (*Aquila chrysaetos*), peregrine falcon (*Falco peregrinus*), prairie falcon (*Falco mexicanus*), flammulated owl (*Psiloscops flammeolus*), yellow-billed cuckoo (*Coccyzus americanus*), Lewis's woodpecker (*Melanerpes lewis*), gray vireo (*Vireo vicinior*), pinyon jay (*Gymnorhinus cyanocephalus*), juniper titmouse (*Baeolophus griseus*), and Brewer's sparrow (*Spizella breweri*). The yellow-billed cuckoo (candidate for Federal listing as threatened or endangered) and the bald eagle, peregrine falcon, flammulated owl, and Brewer's sparrow are considered BLM sensitive species as well as being BCC species.

The minimal amount of pinyon-juniper habitat provides potential nesting sites for the pinyon jay, juniper titmouse, and gray vireo, with the last species much less likely based on geographic range. Non-BCC species potentially nesting in pinyon-juniper in the project area include migrants such as the black-chinned hummingbird (*Archilochus alexandri*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), dusky flycatcher (*Empidonax oberholseri*), American robin (*Turdus migratorius*), mountain bluebird (*Sialis currucoides*), western bluebird (*S. mexicana*), blue-gray gnatcatcher (*Polioptila caerulea*), plumbeous vireo (*Vireo plumbeus*), black-throated gray warbler (*Dendroica nigrescens*), and chipping sparrow (*Spizella passerina*).

Semi-desert shrublands in the project area provide marginal habitat for the Brewer's sparrow, a near-obligate in sagebrush shrublands. Non-BCC species associated with shrublands include the western

meadowlark (*Sturnella neglecta*) and three species of Neotropical migrants: western kingbird, vesper sparrow (*Pooecetes gramineus*), and lark sparrow (*Chondestes grammacus*).

Passerines commonly found in the project vicinity but resident species in the region include the western scrub-jay (*Aphelocoma californica*), black-billed magpie (*Pica hudsonia*), Townsend's solitaire (*Myadestes townsendii*), mountain chickadee (*Poecile gambeli*), and house finch (*Haemorhous mexicanus*). The chukar (*Alectoris chukar*), a non-native gallinaceous species widely introduced as a gamebird, is present in relatively low numbers on nearby slopes below the Roan Cliffs.

Two BCC raptors, the golden eagle and prairie falcon, may include the project vicinity within large foraging areas associated with nest sites along cliffs to the north. This use would be occasional and transitory. Other non-BCC raptors potentially nesting and foraging in the project vicinity include the American kestrel (*Falco sparverius*), Cooper's hawk (*Accipiter cooperii*), sharp-shinned hawk (*A. striatus*), northern harrier (*Circus cyaneus*), great horned owl (*Bubo virginiana*), and long-eared owl (*Asio otus*). No occupied raptor nests were documented during surveys (WestWater 2014).

Environmental Consequences

Proposed Action

Under the Proposed Action, removal of 2.97 acres of sparse juniper woodlands with openings of sagebrush, saltbush, and greasewood would result in loss of existing and potential nesting sites. While habitat loss and fragmentation may affect individual birds, it is not expected to adversely impact a species as a whole. If construction, drilling, or completion activities occur during the nesting season, visual and noise disturbance near active nests could cause nest abandonment and failure, reducing the productivity of affected species. Construction activity during the nesting season could also result in the destruction of clutches and/or mortality of nestlings.

Raptor nest surveys in the project vicinity did not result in location of raptor nest structures within 0.25 mile of the well pad or 0.125 mile of the access road, pipeline, or other surface facility associated with this project, therefore a TL is not required. However, a separate stipulation would prohibit removal of vegetation during the period May 15 to July 15 to reduce adverse impacts to migratory birds such as BCC species.

In addition to these restrictions, the operator is subject to the MBTA, administered by the USFWS, which precludes the "take" of any raptor or most other native species. Under the Act, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. The USFWS interprets "harm" and "kill" to include loss of eggs or nestlings due to abandonment or reduced attentiveness by one or both adults as a result of disturbance by human activity, as well as physical destruction of an occupied nest. Adherence to the 60-day TL period does not ensure compliance with the MBTA.

No Action Alternative

The No Action Alternative would constitute denial by the BLM of WPX's application for a ROW grant, which would preclude disposal of produced water from WPX wells into the pore space of Federal minerals. A decision by the BLM to deny the ROW application would obviate the need for drilling and operation of the water disposal well as proposed by WPX. This would result in no new impacts to migratory birds.

SUMMARY OF CUMULATIVE IMPACTS

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

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

Activities associated with implementing the Proposed Action would contribute incrementally to the collective adverse impact for some resources. Although the contribution would be minor, the Proposed Action would have cumulative impacts on surface resources in the county and field office area.

It should also be noted, however, that the Proposed Action would have positive impacts. Specifically, with the large volume of saltwater produced during extraction of fluid mineral resources in both Federal and private oil and gas leases, unavoidable adverse impacts accompany measures to dispose of the water properly and safely. Although a large amount of the produced water is recycled and used in the well development process, most of the recycled is eventually be disposed.

At present, disposal of produced water consists primarily of solar evaporation. This process involves numerous truck trips to/from a solar evaporation facility, and the remaining brine must be properly handled and disposed. Use of water disposal wells, currently increasing in use within the CRVFO area, avoids the impacts associated with solar evaporation, especially by eliminating numerous and often long-distance truck trips. Although minor impacts to some resources result during drilling of the disposal well, and less so from long-term operation of the well, the process overall is a substantial benefit compared to other methods.

PERSONS AND AGENCIES CONSULTED

WPX Energy: April Mestas, Ashlee Lane, Mike Reynolds, Kris Meil, John Doose, Joe Weaver Jr.

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 Stipulations to be attached and enforced by BLM, are listed in Table 5.

Table 5. 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
Allen Crockett, Ph.D., J.D.	Supervisory Natural Resource Specialist	Technical Review, NEPA Review
Shauna Kocman, Ph.D., P.E.	Petroleum Engineer	Downhole Stipulations Air Quality, Noise, Soils, Surface Water, Waters of the U.S.
Julie McGrew	Natural Resource Specialist	Visual Resources
Judy Perkins, Ph.D.	Botanist	Invasive Non-native Species, Special Status Plants, Vegetation
Sylvia Ringer	Wildlife Biologist	Migratory Birds, Special Status Species Animals, Aquatic and Terrestrial Wildlife
Todd Sieber	Geologist	Geology and Minerals, Groundwater, Paleontology

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APPENDIX

Exhibit B, Stipulations
Site Right-of-Way COC76427

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EXHIBIT B
STIPULATIONS, COC76427 (WPX Site ROW for Disposal of Produced Water)

Project Stipulations

1. This ROW grant is independent of Environmental Protection Agency (EPA) and Colorado Oil and Gas Conservation Commission (COGCC) approvals. If the holder (WPX) identifies a conflict between this approval and the necessary approvals granted by the EPA and/or COGCC, the holder will immediately notify this office and propose corrective actions to remedy the conflict.

2. This ROW is granted only for the disposal of produced water into the pore space of Federal minerals through the fee RWF 933-19D disposal well and is completely dependent upon the approval and authorization of the drilling of the RWF 933-19D disposal well by the COGCC.

3. Cost Per Barrel Fee. The initial cost per barrel fee shall be ($0.15) of produced water injected into the Federal pore space of the RWF 933-19D well. Prior approval shall be obtained from the BLM for the procedures and equipment proposed to be used for measurement of produced water injected into the RWF 933-19D well before such injection begins. The BLM may modify the proposal and condition the approval.

4. Exclusive Use. This ROW is granted to WPX for the exclusive use of the pore space within Federal minerals (through the COGCC-approved RWF 933-19D saltwater disposal well) and shall involve the disposal of produced water originating only from those wells operated by the holder, as recognized by the BLM or COGCC.

5. Annual Injection Reports. The holder must provide the Authorized Officer an annual injection volume report by October 15 of each year. The report needs to break down the number of barrels disposed by month with a yearly total. The report can be submitted electronically or in writing to this office. The initial report will be for the period from grant issuance through **September 30, 2014**. Subsequent reports will be for the period **October 1 through September 30** of the following year.

6. Federal Mineral Protections.

   a. If the BLM determines in the future that the RWF 933-19D salt-water disposal well adversely affects federal minerals, then the BLM can rescind the right-of-way and require the well to be plugged.

   b. Within 30 days of completed operations, submit the (1) directional survey, (2) driller's event log/operations, and (3) any open-hole logs to Peter Cowan at picowan@blm.gov.

   c. As a minimum, cement shall be brought to 200 feet above the Mesaverde. A CBL shall be run to verify the TOC and an electronic copy will be submitted to Peter Cowan at picowan@blm.gov within 48 hours. If the TOC is lower than required or the cement sheath of poor quality, then a CRVFO petroleum engineer shall be notified for remedial operations within 48 hours from running the CBL.

7. Raptor Nesting. Raptor nest surveys in the project vicinity conducted in February 2014 did not result in location of raptor nest structures within 0.25 mile of a well pad or 0.125 mile of an access road, pipeline, or other surface facility associated with this project. Therefore, a raptor nesting TL is not required. However, to help ensure compliance with the Migratory Bird Treaty Act (MBTA), the operator should schedule construction or drilling activities to begin outside the raptor nesting season (**February 1 to August 15**) if practicable. If initiation of construction, drilling, or completion

activities during these dates cannot be avoided, 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.

8. 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.

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

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

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

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

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

   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).

9. Cultural Resource Mitigation. (*Disclosure of site location information is prohibited under 43 CFR7.18).* Archaeological monitoring conducted by an archaeological firm qualified and permitted to do this type of archaeological work within the Colorado River Valley Field Office area is required during all phases of construction of the pipeline in the NW¼SW¼ of Section 20. Maps with the exact location of the section of pipeline to be monitored will be provided to the excavation firm by the archaeological contractor.

   - No ground-disturbing construction activities (topsoiling, ditching, etc.) will begin prior to the archaeologist's arrival. WPX Energy Rocky Mountain, LLC is responsible for notifying the archaeological firm at least 72 hours in advance of any proposed ground disturbance in the specified areas. WPX Energy Rocky Mountain, LLC is responsible for any and all construction delays and/or damage to cultural manifestations due to insufficient notification of the Archaeological Contractor, and or noncompliance with the procedures.

   - Archaeological monitoring will involve on-the-ground visual inspection of all construction for the pipeline within the above specified areas. The archaeologists will follow all the ground disturbing equipment at a cautionary distance, allowing time for the construction dust to settle and for visible detection of buried cultural features to occur. If cultural resources are discovered, all ground disturbing activities in the vicinity of identified feature(s) will be halted and a buffer area at least 100 feet from the identified feature(s) will be protected from any additional disturbance until which time as the feature(s) is mitigated via data recovery. Appropriate samples for analysis to determine cultural/temporal affiliation, and subsistence will be collected and analyzed as appropriate. At least one stratigraphic profile will be made for each feature identified, and samples for paleoenvironmental reconstructions will be taken as appropriate. Periodic reporting to the BLM archaeologist of progress and findings will be completed on a weekly or more frequent schedule as deemed necessary by the BLM authorized officer.

   The extension of Federal protection to cultural resources on affected portions of private land is specified in BLM Manual 8100.07 (Responsibility for Non-Federal Cultural Resources).

FONSI

DOI-BLM-CO-N040-2014-0014-EA

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

DECISION RECORD

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

RATIONALE: The bases for this decision are as follows:

1. This Decision would enhance operational efficiency of WPX's oil and gas development of Federal fluid minerals by improving the management of produced water and other fluids used in the production of natural gas.

2. The environmental impacts would be avoided, minimized, or offset with the mitigation measures incorporated into the Proposed Action or attached and enforced by BLM as Stipulations in the BLM Right-of-way grant.

3. This Decision does not authorize the initiation of any surface-disturbing activities on BLM lands or of drilling activities associated with any Federal oil and gas well. Initiation of activities related to disposing of produced waters within the pore space of Federal minerals through the fee RWF 933-19D disposal well (permitted by COGCC) may commence only upon approval by BLM of the site Right-of-Way.

MITIGATION MEASURES: Stipulations of the BLM site right-of-way presented in Appendix A (Exhibit B) of the EA would be incorporated for the disposal of produced water within the pore space of Federal minerals.

NAME OF PREPARER: Jim Byers, Natural Resource Specialist

SIGNATURE OF AUTHORIZED OFFICIAL:

Allen B Crockett

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

DATE: Feb 25, 2014