

United States Department of the Interior
Bureau of Land Management
San Luis Valley Field Office
46525 Highway 114
Saguache, CO 81149

Draft Environmental Assessment

DOI-BLM-CO-300-2012-012-EA
DAHC San Francisco #1 Well

May 31, 2013



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CHAPTER 1 - INTRODUCTION

1.1 IDENTIFYING INFORMATION

CASEFILE/PROJECT NUMBER (OPTIONAL):

PROJECT TITLE: DOI-BLM-CO-300-2012-012-EA San Francisco #1 APD

PLANNING UNIT: San Luis Valley Field Office, San Luis Resource Area, Front Range District

LEGAL DESCRIPTION: The San Luis Valley Field Office administers lands within the San Luis Resource Area (SLRA). T. 39 N., R. 5 E. Section 24, NESW, New Mexico Principal Meridian; Rio Grande County, Colorado

APPLICANT: Dan A. Hughes Company

1.2 INTRODUCTION AND BACKGROUND

BACKGROUND: This Environmental Assessment (EA) has been prepared by the Bureau of Land Management (BLM) to analyze the environmental impacts of the Dan A. Hughes Company (DAHC) – San Francisco Creek #1 well, as proposed by the DAHC in their Application for Permit to Drill dated December 8, 2011. The EA will assist the BLM in determining whether significant impacts could result from the proposed action. The analysis is an important element in the decision making process but it is also required for compliance with the National Environmental Policy Act (NEPA). “Significance” is defined by NEPA and is found in regulation 40 CFR 1508.27. An EA provides evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a statement of “Finding of No Significant Impact” (FONSI). If the decision maker determines that this project could have “significant” impacts following the analysis in the EA, then an EIS would be prepared for the project. If the project would not have “significant” impacts, a Decision Record (DR) may be signed for the EA approving the selected alternative, whether the proposed action or another alternative. A DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in “significant” environmental impacts (effects) beyond those already addressed in San Luis Resource Management Plan (RMP), approved in December 1991. BLM decisions issued as a result of this EA would apply only to BLM administered public lands (mineral estate).

The environmental impacts being analyzed are associated with road and drill pad construction, as well as, the development of an exploratory oil and gas well on split-estate lands in Rio Grande County, approximately 5 miles south of Del Norte, Colorado as described in the APD. DAHC proposes to drill an exploratory well from a well pad in the NESW of section 24, T. 39N., R. 5E., NMPM, Approximately 5 miles south of Del Norte, Colorado (See Figure 1, Project

Map). All development work will take place on the private surface owned by DAHC with the federal mineral estate administered by the BLM, San Luis Valley Field Office.

1.3 PURPOSE AND NEED

This EA is prepared in compliance with the NEPA, as amended (Public Law [PL] 91-90, 42 USC 4321 et seq.). This EA has been prepared in compliance with all applicable regulations and laws passed subsequent to the NEPA, including Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] § 1500-1508); U.S. Department of the Interior (USDI) requirements (Department Manual 516, Environmental Quality [USDI 2004]); and BLM guidelines in Handbook H-1790-1 (USDI/BLM 2008a).

The purpose of the action is to respond to the APD submitted by the DAHC and evaluate the potential environmental impacts of the proposal to drill an exploratory well and construct the associated surface infrastructure. The need for the action is to approve, deny, or approve with modifications to the APD as submitted by the DAHC.

The BLM's policy is to make mineral resources available for disposal and to encourage development of mineral resources to meet national, regional, and local needs in accordance with BLM's multiple-use mandate under the Federal Land Policy and Management Act of 1976 (FLPMA). The BLM oil and gas leasing program promotes the development of domestic oil and gas resources and the reduction of U.S. dependence on foreign energy sources. Oil and gas exploration and development is recognized as an appropriate use of public lands in the RMP that provides management direction for the leased area. BLM will consider the proposed exploratory drilling and access in a manner that avoids or reduces impact on other resources and activities as identified in the RMP. The need for the action is established by the BLM's authority under the Mineral Leasing Act, the Mining and Minerals Policy Act of 1970 (30 USC § 21 et seq.), the FLPMA (43USC § 1701 et seq.), the National Materials and Minerals Policy, Research, and Development Act of 1980 (30 USC § 1601 et seq.), and the Federal Onshore Oil and Gas Leasing Reform Act of 1987 (30 USC § 181 et seq.)

1.4 DECISION TO BE MADE

The BLM will decide whether to approve the proposed [San Francisco Creek #1 Well] action based on the analysis contained in this Environmental Assessment (EA). This EA will analyze the proposed action to construct a well pad and access road, in order to drill and develop federal minerals from a private surface location. Access to the proposed well pad would be on existing county and rural roads. The finding associated with this EA may not constitute the final

approval for the proposed action. The BLM may choose to: a) implement the project as proposed, b) implement the project with modifications/mitigation, c) implement an alternative to the proposed action, or d) not implement the project at this time. The BLM will approve, deny or approve with modifications.

1.5 PLAN CONFORMANCE REVIEW

PLAN CONFORMANCE REVIEW: The Proposed Action is subject to and has been reviewed for conformance with the following plan (43 CFR 1610.5, BLM 1617.3):

NAME OF PLAN: San Luis Resource Area Resource Management Plan

DATE APPROVED: December 18, 1991

DECISION NUMBER: SLVRA RMP.ROD, Chapter 2, page 8. Approved on December 18, 1991

DECISION: “Federal and split-estate lands will be open to leasing under standard lease terms...”

In January 1997, the Colorado State Office of the BLM approved the Standards for Public Land Health and amended all RMPs in the State. Standards describe the conditions needed to sustain public land health and apply to all uses of public lands.

Standard 1: Upland soils exhibit infiltration and permeability rates that are appropriate to soil type, climate, land form, and geologic processes.

Standard 2: Riparian systems associated with both running and standing water function properly and have the ability to recover from major disturbance such as fire, severe grazing, or 100-year floods.

Standard 3: Healthy, productive plant and animal communities of native and other desirable species are maintained at viable population levels commensurate with the species and habitat’s potential.

Standard 4: Special status, threatened and endangered species (federal and state), and other plants and animals officially designated by the BLM, and their habitats are maintained or enhanced by sustaining healthy, native plant and animal communities.

Standard 5: The water quality of all water bodies, including ground water where applicable, located on or influenced by BLM lands will achieve or exceed the Water Quality Standards established by the State of Colorado.

Because standards exist for each of these five categories, a finding must be made for each of them in an environmental analysis. These findings are located in Chapter 3 of this document.

1.6 SCOPING, PUBLIC INVOLVEMENT AND ISSUES

Under the National Environmental Policy Act (NEPA) policy, scoping is the process used to solicit internal and external input on the issues, impacts, and potential alternatives that will be addressed in an Environmental Assessment (EA) as well as the extent to which those issues and impacts will be analyzed in the NEPA document. While scoping for an EA is optional (40 CFR 1501.7), the San Luis Valley Field Office believes that the analysis of this proposed action – the first BLM-considered oil and gas exploratory well in the San Luis Valley in decades – stands to benefit greatly from public input.

On August 20, 2012, the San Luis Valley Field Office announced a 30-day scoping period for the San Francisco Creek #1 Application for Permit to Drill (APD) Environmental Assessment. The BLM also held a public scoping meeting on September 6, 2012 at the Rio Grande County Annex in Del Norte. Over the course of the 30-day period the BLM received 42 written comments addressing a wide range of resource concerns.

The BLM's policy on implementing NEPA gives guidance on identifying issues for analysis within a NEPA document. For the purpose of a BLM NEPA, an "issue" is a point of disagreement, debate, or dispute with a proposed action based on some anticipated environmental effect. An issue is more than just a position statement – such as disagreeing with oil and gas development of the federal mineral estate. An issue has a cause and effect relationship with the proposed action or alternatives; is within the scope of the analysis; has not been decided by law, regulation, or previous decision; and is amenable to scientific analysis rather than conjecture.

The public comments we received identified many issues that we address within this environmental analysis, such as water and air quality (Sections 3.2.4 & 3.2.1), wildlife (section.3.3), visual resources (section 3.4.3), and geology (section 3.2.2).

However, there were also scoping comments did not trigger BLM's guidance on what is considered an issue requiring analysis under NEPA. Some examples of those concerns include statements about whether or not oil and gas development is necessary (generally expressed as a "favor" or "oppose" position statement); concerns regarding potential for a larger oil field development if producible quantities of minerals are discovered (outside the scope of this analysis); and the effect of local land-use ordinances on BLM authority (previously decided by law).

The BLM also received many comments encouraging consideration of the Rio Grande County Hydrology study. While not generally part of a routine environmental analysis for an APD, the BLM was able to work cooperatively with the Rio Grande County team to consider their findings within our analysis.

Public involvement and input a vital part of the NEPA process. The BLM will collect public comments on this draft environmental analysis for 30-day period before finalizing the document and making a decision on the Application for Permit to Drill.

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CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter outlines the Proposed Action and the No Action alternative. The alternatives and objectives for this proposal were developed using the interdisciplinary team approach and by using on-the-ground knowledge and experience to develop a range of alternatives that meet the underlying need for the proposed action. The No Action Alternative is considered and analyzed to provide a baseline for comparison of the impacts of the proposed action.

The BLM has issued DAHC oil and gas lease COC-69530. The following Proposed Action outlines an exploration of that lease on a site-specific location. The proposed exploration action would be consistent with the terms and conditions of the existing lease. The BLM has the authority, under the Mineral Leasing Act of 1920, to deny the proposed site-specific exploration action. DAHC has the right, under the Federal lease terms, to drill elsewhere on its lease, including the right of access and the right of developing producible hydrocarbon resources.

2.2 ALTERNATIVES ANALYZED IN DETAIL

2.2.1 PROPOSED ACTION

The BLM has received an APD from the DAHC proposing the construction of a well pad and access road on private surface/Federal minerals (split estate) in Rio Grande County, south of Del Norte, Colorado. The DAHC proposed access road would be approximately 1,320 feet in length with 40 foot wide disturbance during construction, and 14 foot running width. The maximum grade for the new access road would not exceed 6.94% slope. There would be 2 culverts; a 12" at the intersection of new and existing road, and 18" at the pad entrance. Additionally, a low water crossing would be utilized, armed with 1- $\frac{3}{4}$ " gravel to allow natural water flow to propagate down the watershed and alleviate the need for maintenance traditionally associated with sediment traps and culverts where sedimentation is a concern. The road will be improved with a 4 inch layer of road base and will have a crown and ditch design. The soil present at the site has approximately 20% clay content which in turn allows for adequate compaction. This should allow for relative stability of fill areas and alleviate the need for resurfacing due to surface material sinking. During new road construction the top soil will be stripped, stored, and used for interim reclamation. Top and subsoil stock piles will be protected from erosion with the use of tracking perpendicular to the slope with machinery and with application of hydro mulch.

The DAHC is proposing construction of a drill pad with a surface disturbance of approximately 2.3 acres, with max cut of 6.95 feet and max fill of 8.43 feet. Approximately six inches of top soil will be stripped from the middle of the pad and stockpiled at both the east and west sides. This will help in preventing mixing the two different soil structures observed at the site. Any soil and sub soil not used for the drill pad construction will be hydro-mulched to prevent erosion and sedimentation. The hydro-mulch color will be consistent with BLM's standard environmental colors in an effort to blend in with the natural landscape and reduces visual contrast. The entire pad will be enclosed with straw bales to berm around the entire well pad to minimize drilling noise, fugitive dust, and reduce visual impacts. The straw bales are 4 feet tall and 8 feet long and will be stacked three high for a total height of 12 feet. The straw bales will be treated with a fire suppressor in order to prevent ignition and potential fire. Sediment fences will be constructed to minimize sediment deposition in a nearby ephemeral drainage and the access road. The proposed sediment fence would be constructed with the use of matting, wooden lathes, and straw wattles. The matting would be "keyed-in" for maximum effectiveness. All fill slopes will be 3:1 and treated with hydro-mulch to prevent erosion. The color of the hydro-mulch will be such that blends in to the natural landscape and reduces visual contrast. Additionally, fill slopes will be tracked in a perpendicular orientation to the slope using machinery, to roughen the surface which should reduce erosion and trap moisture.

No pits or flare stacks are being proposed. The operator will utilize a gas-buster to flare if necessary.

In the event of a dry hole the pad and access road will be graded to original contour, topsoil replaced and the entire area reseeded. Rehabilitation of the well pads and access roads are bonded to ensure compliance with BLM reclamation requirements. The proposed action would include well drilling and completion operations, which would take approximately 45 days. The APD includes a drilling plan and a surface use and operations plan that would be implemented consistent with the terms of Federal Lease COC-69530 , Onshore Order #2, and Conditions of Approval as developed by BLM.

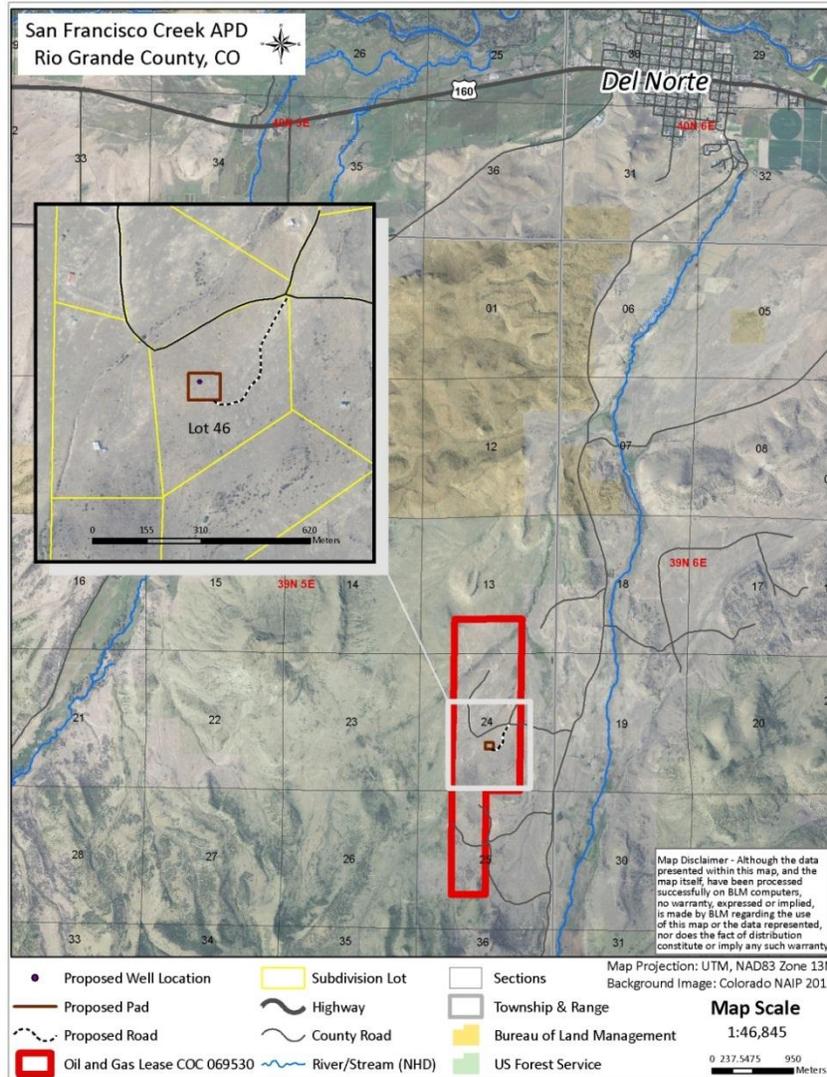


FIGURE 1- PROJECT AREA MAP

2.2.2 NO ACTION ALTERNATIVE

The proposed action involves Federal subsurface minerals that are encumbered with a Federal oil and gas lease, which grants the lessee a right to explore and develop the lease. Although BLM cannot deny the right to drill and develop the leasehold, individual APDs can be denied to prevent unnecessary and undue degradation. The no action alternative constitutes denial of the APDs associated with the proposed action. Under the no action alternative, therefore, none of the proposed developments described in the proposed action would take place.

Other alternatives were not considered due to the proposed action being a non-discretionary action being proposed on private surface.

CHAPTER 3 - AFFECTED ENVIRONMENT AND EFFECTS

3.1 INTRODUCTION

This section provides a description of the human and natural environmental resources that could be affected by the Proposed Action and presents comparative analyses of the direct, indirect and cumulative effects on the affected environment stemming from the implementation of the actions under the Proposed Action and other alternatives analyzed.

3.1.1 INTERDISCIPLINARY TEAM REVIEW

The following table is provided as a mechanism for resource staff review, to identify those resource values with issues or potential impacts from the proposed action and/or alternatives. Those resources identified in the table as impacted or potentially impacted will be brought forward for analysis.

Resource	Initial and date	Comment or Reason for Dismissal from Analysis
Air Quality Chad Meister, COSO		See Affected Environment.
Geology/ Minerals Nicolas Sandoval	NS 02/12/2013	Resources are present but not impacted. See affected environment for geologic description.
Soils Negussie Tedela	NT 03/13/2013	Present and impacted. See affected environment section.
Water Quality - Surface and Ground Negussie Tedela	NT 03/13/2013	Present and impacted. See affected environment section.
Invasive Plants Mark Swinney	MAS 2/28/2013	See Affected Environment.
T&E and Sensitive Species sue Swift Miller, Eduardo Duran	SSM 2/21/2013	See Affected Environment.
Vegetation Melissa Shawcroft, Mark Swinney	MAS 2/28/2013	N/A Surface Estate is private
Wetlands and Riparian Sue Swift-Miller, Jill Lucero	SSM 2/21/2013	N/A Surface Estate is private
Wildlife Aquatic Melissa Garcia	MG	See Affected Environment.
Wildlife Terrestrial Melissa Garcia	MG	See Affected Environment.

Resource	Initial and date	Comment or Reason for Dismissal from Analysis
Migratory Birds Melissa Garcia	MG	See Affected Environment.
Cultural Resources Angie Krall	AK	See Affected Environment.
Native American Religious Concerns Angie Krall	AK	During previous tribal consultation for this area, no traditional cultural properties were identified. The Section 106 Report was sent to the Hopi and Jicarilla Apache tribes upon request. Face-to-face consultation on several projects, including the APD, was also conducted with the Navajo, Hopi, Jicarilla Apache, Picuris, Ute Tribes and the Pueblos of Taos, Picuris, Santa Ana and Santa Clara. The tribes have not expressed any concerns with this oil and gas project.
Socioeconomics David Epstein(SO)		See Affected Environment.
Paleontology		There are no Paleontological Resources within the proposed project areas, and no Paleontological Resources would be affected by the Proposed Action. Therefore, this resource will not be brought forward for analysis.
Visual Resources Sean Noonan	SN, 10/6/12	See Affected Environment.
Environmental Justice David Epstein		See Affected Environment.
Wastes Hazardous or Solid Leon Montoya	LM, 9/13/12	See Affected Environment.
Recreation Sean Noonan	SN, 10/6/12	Surface Estate is Private Property. Therefore, this resource will not be mentioned further within this document.
Farmlands Prime and Unique Eduardo Duran		There are no Prime or Unique Farmlands within the proposed project areas, and no Prime or Unique Farmlands would be affected by the Proposed Action. Therefore, this resource will not be brought forward for analysis.
Lands and Realty Leon Montoya	LM, 8/16/12	Surface Estate is private
Wilderness, WSAs, ACECs, Wild & Scenic Rivers Sean Noonan	SN, 10/6/12	There are no Wilderness, WSA's, ACEC's or Wild and Scenic Rivers within the proposed project area, and no Wilderness, WSA's, ACEC's or Wild and Scenic Rivers would be affected by the Proposed Action. Therefore, this resource will not be brought forward for analysis.
Wilderness Characteristics Sean Noonan	SN, 10/6/12	There are no Wilderness Characteristics within the proposed project area, and no Wilderness Character would be affected by the Proposed Action. Therefore, this resource will not be brought forward for analysis.
Range Management Mark Swinney, Melissa Shawcroft	MAS 2/28/2013	N/A Surface Estate is private
Forest Management	PSM, 1/31/13	N/A Surface Estate is private
Cadastral Survey Joe Velasquez, Leon Montoya, Sean Hines		N/A Surface Estate is private
Noise Martin Weimer, Project Lead, SO	mw, 2/1/13	The project area is situated in rural subdivision with large 35 acre lots. Certain levels of noise are associated with drilling operations, these include drill rig operation, compressors/generators and general machine and vehicle

Resource	Initial and date	Comment or Reason for Dismissal from Analysis
		operation. These impacts are temporary and terminate when drilling operations are complete.
Fire Paul Minow	PSM, 1/31/13	N/A Surface Estate is private

The affected resources brought forward for analysis include:

- Air Quality and Climate
- Geology & Minerals
- Soils
- Water Quality
- Invasive Plants
- Threatened & Endangered Species
- Wildlife Aquatic
- Wildlife Terrestrial
- Migratory Birds
- Wastes Hazardous or Solid
- Cultural Resources
- Visual Resources
- Economics
- Environmental Justice

3.2 PHYSICAL RESOURCES

3.2.1 AIR QUALITY AND CLIMATE

AFFECTED ENVIRONMENT: The proposed action area (Rio Grande County) generally has good air quality and is classified as attainment for all criteria pollutants with respect to the National Ambient Air Quality Standards. Mean temperatures in the area range from 6.7 degrees in January to 78.5 degrees in July. The area receives average annual precipitation of approximately 9.83 inches that is predominately distributed during the summer with lesser amounts in spring and fall, and very little moisture in winter.

Activities occurring within the area that affect air quality include exhaust emission from cars, drilling rigs, agricultural equipment, and other vehicles, as well as fugitive dust from roads, agriculture, and energy development. According the COGCC website, there are currently no producing oil and gas wells located within the vicinity of the proposed action area.

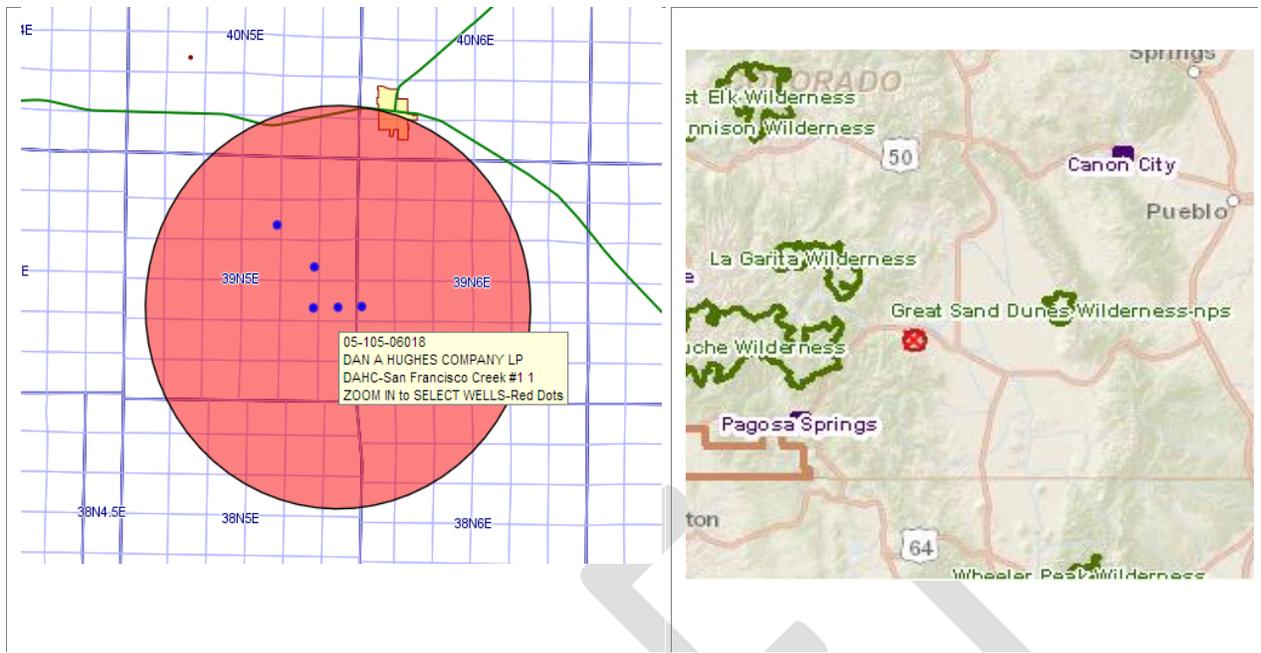


FIGURE 2 - COGCC AND APCD1 GIS LOCATION BOUNDARY MAPS (SAN FRANCISCO CREEK)

¹ Class 1 areas are outlined in green.

REGULATORY FRAMEWORK: The Clean Air Act (CAA), which was last amended in 1990, requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) (40 CFR part 50) for criteria pollutants. Criteria pollutants are air contaminants that are commonly emitted from the majority of emissions sources and include carbon monoxide (CO), lead (Pb), sulfur dioxide (SO₂), particulate matter smaller than 10 & 2.5 microns (PM₁₀ & PM_{2.5}), ozone (O₃), and nitrogen dioxide (NO₂).

The CAA established 2 types of NAAQS:

Primary standards: – Primary standards set limits in order to protect public health, including the health of "sensitive" populations (such as asthmatics, children, and the elderly).

Secondary standards: – Secondary standards set limits in order to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The EPA regularly reviews the NAAQS (every five years) to ensure that the latest science on health effects, risk assessment, and observable data such as incidence rates are evaluated in order to re-propose any NAAQS to a lower limit if the data supports the finding.

The Colorado Air Pollution Control Commission, by means of an approved State Implementation Plan (SIP) and/or delegation by EPA, can established state ambient air quality standards for any criteria pollutant that is at least as stringent as, or more so, than the federal standards. Ambient air quality standards must not be exceeded in areas where the general public has access. Table 3.1 lists the federal and state ambient air quality standards.

TABLE 1 - AMBIENT AIR QUALITY STANDARDS (EPA 2011)

Pollutant [final rule cite]	Primary/ Secondary	Averaging Time	Level	Form
<u>Carbon Monoxide</u> [76 FR 54294, Aug 31, 2011]	primary	8-hour	9 ppm	Not to be exceeded more than once per year
		1-hour	35 ppm	
<u>Lead</u> [73 FR 66964, Nov 12, 2008]	primary and secondary	Rolling 3 month average	0.15 $\mu\text{g}/\text{m}^3$	Not to be exceeded
<u>Nitrogen Dioxide</u> [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]	primary	1-hour	100 ppb	98th percentile, averaged over 3 years
	primary and secondary	Annual	53 ppb	Annual Mean
<u>Ozone</u> [73 FR 16436, Mar 27, 2008]	primary and secondary	8-hour	0.075 ppm	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
<u>Particle Pollution</u> [71 FR 61144, Oct 17, 2006]	PM _{2.5}	Annual	12 $\mu\text{g}/\text{m}^3$	Annual mean, averaged over 3 years
		24-hour	35 $\mu\text{g}/\text{m}^3$	98th percentile, averaged over 3 years
	PM ₁₀	24-hour	150 $\mu\text{g}/\text{m}^3$	Not to be exceeded more than once per year on average over 3 years

Sulfur Dioxide [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]	primary	1-hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary	Annual	0.03 ppm	Arithmetic Average
	secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

TABLE 2. AMBIENT AIR QUALITY MONITORING DATA TRENDS (CDPHE 2009 – 2012, EPA FORMS)

Monitor	Pollutant (Standard)	2009	2010	2011	2012
4 th St.	PM ₁₀ (24hr - µg/m ³)	107	109	118	116
208 Edgemont Blvd.	PM ₁₀ (24hr - µg/m ³)	94	106	130	117

¹ The nearest APCD air monitors to the project site are located at 425 4th St. & 208 Edgemont Blvd. in Alamosa, CO 81101.

The CAA and the Federal Land Policy and Management Act of 1976 (FLPMA) require BLM and other federal agencies to ensure actions taken by the agency comply with federal, state, tribal, and local air quality standards and regulations. FLPMA further directs the Secretary of the Interior to take any action necessary to prevent unnecessary or undue degradation of the lands [Section 302 (b)], and to manage the public lands “in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values” [Section 102 (a)(8)].

The lease area is designated as a Class II Area, as defined by the Federal Prevention of Significant Deterioration (PSD) provision of the CAA. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. The closest Class 1 areas are approximately 55 miles to the west of the proposed action area (La Garita Wilderness and Weminuche Wilderness).

ENVIRONMENTAL EFFECTS: PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

The proposed action will have a temporary negative impact to air quality which will mostly occur during the construction phase. Utilization of the access road, surface disturbance, and construction activities such as drilling, hydraulic fracturing, well completion, and equipment installation will all impact air quality through the generation of dust related to travel, transport, and general construction. This phase will also produce short term emissions of criteria, hazardous, and greenhouse gas pollutants from vehicle and construction equipment exhausts. Once construction is complete the daily activities at the site will be reduced to operational and maintenance checks which may be as frequent as daily visits. Emissions will result from vehicle exhausts from the maintenance and process technician visits, as well as oil and produced water collection or load out trips. The pads can be expected to produce fugitive emissions of well gas and liquid flashing gases, which can contain a mixture of methane, volatile organic compounds, and inert or non-regulated gases. Fugitive emissions may result from pressure relief valves and working and breathing losses from any tanks located at the site, as well as any flanges, seals, valves, or other infrastructure connections used at the site. Liquid product load-out operations and pipeline transport can also generate fugitive emissions of VOCs.

Ozone is not directly emitted like other criteria pollutants. Ozone is chemically formed in the atmosphere via interactions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight and under certain meteorological conditions (NO_x and VOCs are ozone precursors). Ozone formation and prediction is complex, generally results from a combination of significant quantities of VOCs and NO_x emissions from various sources within a region, and has the potential to be transported across long ranges. Therefore, it is typically not appropriate to assess (i.e. model) potential ozone impacts of a minor project on potential regional ozone formation and transport. However, the State of Colorado assesses potential ozone impacts from its authorizing activities on a regional basis when an adequate amount of data is available and where such analysis has been deemed appropriate. No such work has ever been performed for the Rio Grande County area, since its relatively minor emissions are not expected to contribute to any regional ozone formation potential. For this reason (inappropriate scale of analysis), ozone will not be further addressed in this document beyond the related precursor discussions, and an appropriate qualitative analysis/comparison to background emissions inventories for the county (see cumulative impacts).

Emission estimates from the proposed well site were calculated for this EA, and are disclosed in Table 3.2 below. The emissions inventory (EI) considered reasonably foreseeable oil and gas development activities for the proposed well and includes emissions from both construction and production operations. The following pollutants were inventoried where an appropriate basis, methodology, and sufficient data exists: CO, NOX (includes NO_2), $\text{PM}_{2.5}$, PM_{10} , SO_2 , VOCs, HAPs, CO_2 , CH_4 , and N_2O . The EI was developed using reasonable but conservative scenarios for each activity. Production emissions were calculated based on full production

activity for the entire year (2013), and since this will not be the case in reality, the production emissions are considered conservative. Potential emissions were calculated for the well assuming the minimum/basic legally required control measures, site specific voluntary operator controls, operational parameters, and any equipment configurations data that was provided by the applicant.

The following assumptions were applied consistently to all potential activities:

- The EI used a disturbed surface area of 3 acres for the well pad and access road construction.
- The EI assumed 20 acres of disturbed surface for any pipeline construction.
- All disturbed surfaces (pads and access roads) would receive appropriate application of water (during construction) or dust palliatives (during operations), but were calculated to achieve a 0 % dust control factor to be conservative.
- All diesel fuel would be standard #2 grade (500 ppm sulfur).
- The well pad equipment would include tanks, separation equipment, and well head compression, but no dehydration or desulfurization units.
- Drill rigs emissions were based on EPA Non-road Tier 2 emissions standards.

Table 3. Estimated Maximum Annual Emissions (2013) from SAN FRANCISCO Creek

Total Emissions (Tons per Year)									
Pollutant:	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}	CO ₂	CH ₄	N ₂ O
Construction Phase:	0.47	0.29	0.04	0.0001	1.99	0.06	33.84	0.001	0.0003
Development Phase:	14.76	2.97	0.75	0.0002	4.89	0.49	2133.22	1.02	0.0517
Operation Phase:	0.39	0.36	2.98	0.0001	0.04	0.23	390.71	13.09	0.0008
Total:	15.63	3.62	3.77	0.0004	6.93	0.77	2557.77	14.11	0.0527

Total Emissions (Tons per Year)							CO ₂ equivalence (Global Warming Potential)	
Pollutant:	Benzene	Toluene	Ethylbenzene	Xylene	n-Hexane	HAPs	Total TPY:	2870.49
Construction Phase:	0.00	0.00	0.00	0.00	0.00	0.00	CO ₂ 1.00	
Development Phase:	1.36	0.95	0.00	0.55	1.67	0.03	CH ₄ 21.00	
Operation Phase:	0.04	0.02	0.00003	0.011	0.19	0.25	N ₂ O 310.00	
Total:	1.40	0.97	0.00003	0.56	1.85	0.28		

H ₂ S Emissions	
Total TPY:	0.00

Table 3-5 below demonstrates a relative comparison of the estimated project emissions to Rio Grande County’s total emissions from 2008. It also shows Rio Grande County’s oil and gas area and point source emissions for the same period.

TABLE 4. PROPOSED ACTION & RIO GRANDE COUNTY EMISSIONS COMPARISONS¹

Pollutant	Emissions, Tons per year			
	San Francisco Creek	Rio Grande County Total Emissions (2008)	Rio Grande County Oil & Gas Area Source Emissions	Rio Grande County, Oil & Gas Point Source Emissions
NO _x	15.63	837	ND	5.22
CO	3.62	6,559	ND	5.22
VOC	3.77	957	ND	1.57
PM ₁₀	6.93	1,558	ND	0.05
PM _{2.5}	0.77	528	ND	ND
SO _x	0.0004	26	ND	0.003
HAPs	0.28	195	ND	0.003

¹ 2008 EPA NEI, CDPHE 2008 APEN Database/Emissions Inventory (most current available). ND = No Data. CDPHE HAP inventory is for benzene only.

The project emissions are relatively small compared to the aggregate County emissions, less than 0.3%. APCD published modeling guidance (Colorado Modeling Guideline for Air Quality Permits - January 2002, April 2010) that established thresholds for requiring additional analysis when emissions are exceeded on an annual or short term basis. The modeling thresholds were developed to identify new sources and modifications that would have relatively small impacts on ambient air quality and would not warrant further analysis with respect to applicable standards with a few exceptions. The thresholds (de minimis emissions) establish levels of emissions which have a low probability of causing or contributing to the exceeding of an air quality standard. Each of the APDs calculated emissions are below the APCD established thresholds. Although not specifically a stationary source (i.e., most of the sources are mobile,

and would have minimal emissions occurring at the individual sites), the context allows for a reasonable analysis of the estimated worst case emissions that suggests the projects would have insignificant impacts to regional air quality.

GREENHOUSE GAS EMISSIONS AND CLIMATE CHANGE: According to the U.S. Global Change Research Program (2009), global warming is unequivocal, and the global warming that has occurred over the past 50 years is primarily human-caused. Standardized protocols designed to measure factors that may contribute to climate change, and to quantify climatic impacts, are presently unavailable. Moreover, specific levels of significance have not yet been established by regulatory agencies. Predicting the degree of impact any single emitter of GHGs may have on global climate, or on the changes to biotic and abiotic systems that accompany climate change is highly complex, has considerable uncertainty, and requires intense computer modeling (i.e., super computers). As such, no readily available tools exist to predict impacts a project's emissions would have on the global, regional, or local climate. This analysis is therefore limited to comparing the context of total project GHG emissions, and to emissions recently analyzed by EPA. The analysis also discloses readily available information regarding expected changes to the global climatic system and any empirical evidence of climate change that has occurred to date (see cumulative impacts).

The implementation of the Proposed Action Alternative is estimated to contribute 2,870 tons of carbon dioxide equivalent (CO₂(e)) in the maximum year (2013). Annual operating GHG emissions will be 23% of the total emissions shown for the maximum year. Over the 25 year project timeframe the total GHG emissions expected are approximately 3,427 tons. The total provided does not account for the ultimate use or consumption of any produced minerals at this time due to the fact that the ultimate form of use and any additional processing required to render the product to sufficient quality (which would cause changes to the quantity of product) cannot be predicted with any reasonable certainty. Additionally, it should be noted that production values could vary significantly over the life of the project, making any prediction of the quantities of GHG emitted highly speculative.

In 2007, the state of Colorado's GHG emissions were 124,000,000 metric tons. The proposed action's GHG emissions represent about 0.0023 % of the state of Colorado's GHG emissions. The relative magnitude of greenhouse gas emissions associated with the development of the well is by comparison insignificant.

To provide additional context, the EPA has recently modeled global climate change impacts from a model source emitting 20% more GHGs than a 1500MW coal-fired steam electric

generating plant (approx. 14,132,586 metric tons per year of CO₂; 273.6 metric tons per year of nitrous oxide; and 136.8 metric tons per year of methane). It estimated a hypothetical maximum mean global temperature value increase resulting from such a project. The results ranged from 0.00022 and 0.00035 degrees Celsius occurring approximately 50 years after the facility begins operation. The modeled changes are extremely small, and any downsizing of these results from the global scale would produce greater uncertainty in the predictions. The EPA concluded that even assuming such an increase in temperature could be downscaled to a particular location, it "would be too small to physically measure or detect," see Letter from Robert J. Meyers, Principal Deputy Assistant Administrator, Office of Air and Radiation re: "Endangered Species Act and GHG Emitting Activities (Oct. 3, 2008). The project emissions are a fraction of the EPA's modeled source and are shorter in duration, and therefore reasonable to conclude that the project would have no measurable impact on the climate.

TABLE 5. GREENHOUSE GAS EMISSION COMPARISONS

Inventory Description	CO ₂ e Emissions (10 ⁶ mtpy)	Proposed Action Percentage
Colorado (2007)	124	0.0023
Total US Greenhouse Gases ¹	6,957	0.00000041

¹Inventory of US Greenhouse Gas Emissions and Sinks: 1990–2008 (EPA 2010a) EPA Emissions

CUMULATIVE IMPACTS:

The addition of the infrastructure needed to construct and drill the additional pad and well would have a cumulative impact to the area's air quality; however, given the existing level of development in the area and current air quality, the proposed well's impact would be very minor. The surface area is controlled by the company as to exclude public access, and as such, ambient air quality should not be affected by the proposed action. In the long term, if economical quantities of oil and gas are found, additional wells can be expected to be drilled on Federal, State, and private lands. This could result in a larger impact to air quality in the future. The area has only minimal oil and gas development and according to the COGCC database all of the area's well locations that have been drilled are dry and abandoned. Short term emissions and the lower likelihood of actual production make the probability of significant cumulative effects unlikely.

With respect to GHG emissions, the following predictions were identified by the EPA for the Mountain West and Great Plains region

(<http://www.epa.gov/Region8/climatechange/pdf/ClimateChange101FINAL.pdf>):

- The region will experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow will be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs will be drier.
- More frequent, more severe, and possibly longer-lasting droughts will occur.
- Crop and livestock production patters could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions will reduce the range and health of ponderosa and lodge pole pine forests, and increase the susceptibility to fire.
- Grasslands and rangelands could expand into previously forested areas.
- Ecosystems will be stressed and wildlife such as the mountain line, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

If these predictions are realized as mounting evidence suggests is already occurring, there could be impacts to resources within the region. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils. Warmer temperatures with decreased snowfall could have an impact on a particular plants ability to sustain itself within its current range. An increased length of growing season in higher elevations could lead to a corresponding variation in vegetation and change in species composition. These types of changes would be most significant for special status plants that typically occupy a very specific ecological niche. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened or endangered plants may be accelerated. Invasive plant species would be more likely to out-compete native species.

Increases in winter temperatures in the mountains could have impacts on traditional big game migration patterns. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Warmer winters with less snow would impact the Canada lynx by removing a competitive advantage they have over other mountain predators. Earlier snowmelt could also have impacts on cold water fish species that occupy streams throughout the planning area. Climate change could affect seasonal frequency of flooding and alteration of floodplains, which could impact riparian conditions. More frequent and severe droughts would have impacts on many wildlife species

throughout the region as well as vegetative composition and availability of livestock forage in some areas. Climate change could increase the growing season within the region, however, so longer growing season in theory would result in more forage production provided there is sufficient precipitation. Drier conditions could have severe impacts on forests and woodlands. This could leave these forests and woodlands more susceptible to insect damage and at higher risk of catastrophic wildfires. Increased fire activity and intensity would increase greenhouse gas emissions.

PROTECTIVE/MITIGATION MEASURES:

Require Dan A. Hughes Company (DAHC) to use industry best practices, including watering, graveling, and reseeded to reduce fugitive dust emissions from vehicular traffic and disturbed surfaces. Interim reclamation practices in accordance with the BLM Goldbook Standards will be implemented in order to stabilize the site and prevent fugitive dust from being generated. In addition the following BLM requirements will apply:

- Process equipment will be permitted by CDPHE in accordance with applicable requirements and required emissions standards to limit the facility's potential to emit and provide appropriate operating, monitoring, and recordkeeping requirements.
- All Drill Rig engines will be required to meet at minimum EPA Non-Road Tier II Emissions Standards.
- It is recommended that any FRAC Pump engines be required to meet EPA Non-Road Tier III Emissions Standards.

It is expected that the operator will comply with these requirements and make every effort to minimize emissions through good engineering and operating practices to the maximum extent practical.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

None of the proposed action elements would be authorized and therefore none of the potential emissions would occur. No impacts to air quality would occur. The incremental increase to global GHG burden would not happen, however it is entirely likely the predicted climatic changes will occur regardless.

PROTECTIVE/MITIGATION MEASURES: Not Applicable.

3.2.2 GEOLOGIC AND MINERAL RESOURCES

AFFECTED ENVIRONMENT:

The affected lands are within the foothills of the San Juan Mountains. This mountain range is the largest erosional remnant of an expansive (9,000 square miles) volcanic field, known as the San Juan Volcanic field, which covered most of the Southern Rocky Mountains in Oligocene and later time (Steven and Epis, 1968). Throughout the San Juan Mountains the general volcanic sequence includes the Conejos Formation which is characterized by the initial intermediate lavas and breccias that were erupted from numerous scattered volcanoes. (See figures X & XXX) These were followed by explosive ash-flow eruptions of quartz latite and low-silica rhyolite. In Early Miocene the character of volcanism changed and basalt and minor rhyolite were erupted intermittently through the Miocene and Pliocene. (See Lipman and others, 1970.) As described in the Rio Grande County Hydrogeologic report, the Conejos Formation is believed to be the primary aquifer within the San Francisco Creek Watershed and is considered to be highly heterogeneous and anisotropic¹, specifically due to its sporadic faulting and fractured nature as well as the variable sedimentary formations derived from its volcanic deposition.

¹ with different properties in different directions: describes something with physical properties that are different in different directions

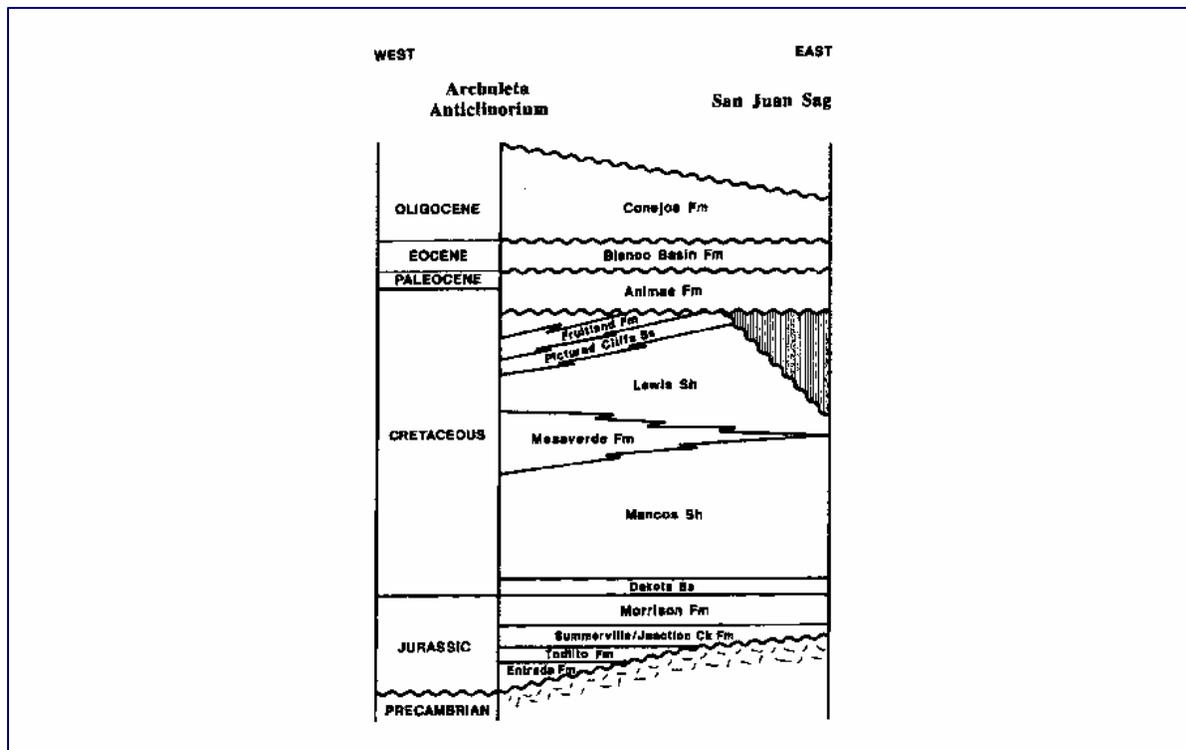


FIGURE 3 – GENERALIZED STRATIGRAPHIC COLUMN FOR THE SAN JUAN SAG REGION (FROM GRIES, 1989)

The San Juan volcanic field conceals a Laramide foreland basin known as the San Juan Sag. During most of the Late Cretaceous to Eocene Laramide Orogeny in the San Juan region, the San Juan Sag was a northeastern embayment of the San Juan Basin. It was modified by rifting in the middle Tertiary (Gries, 1989).

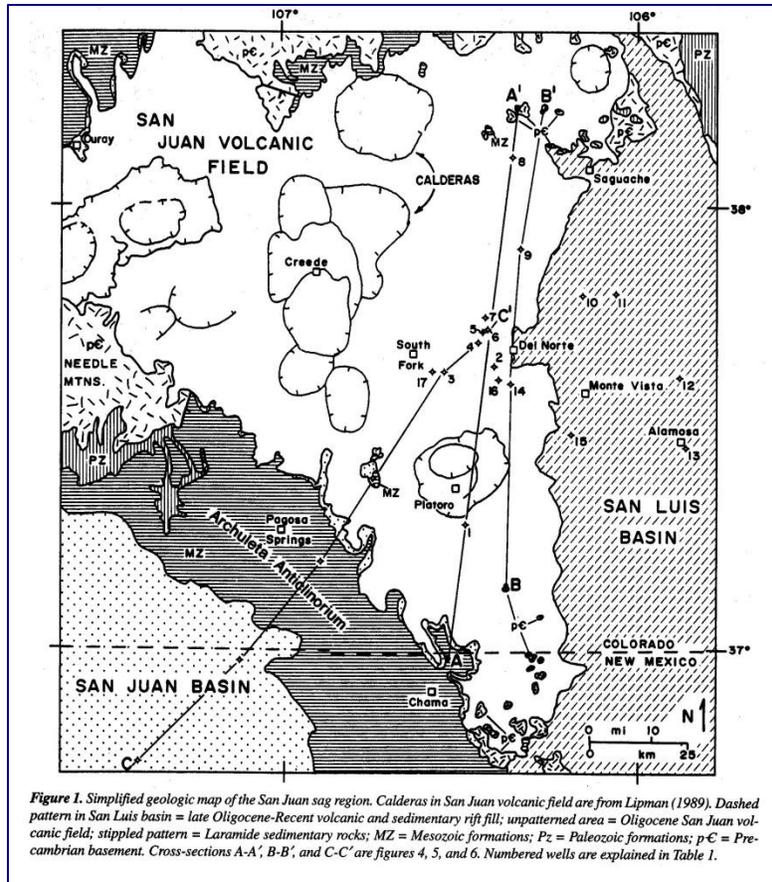


FIGURE 4 - SIMPLIFIED GEOLOGIC MAP OF THE SAN JUAN REGION (BRISTER AND CHAPIN, 1994)

Preserved within the San Juan Sag are Jurassic through Eocene strata that include the San Juan Sag oil and gas play of Gries (1985). A play is “a set of oil or gas accumulations that are geologically, geographically, and temporally related and that exist by virtue of identical or similarly geological conditions” (Huffman and Molenaar, 1997.) The San Juan Sag play is primarily an oil play in Cretaceous and Jurassic sandstones and possibly Oligocene igneous reservoirs (Molenaar, 1988). Oil and gas traps will most likely be structural, including both anticlinal and fault traps, with depths ranging from 6,000 ft. to 13,000 ft. (Holm and Dersch, 1995, p. 10.) The mean estimate of undiscovered recoverable conventional oil and gas in the play is 6.5 million barrels of oil and 7.0 billion cubic ft. of gas (Powers, 1993.) The San Juan Sag play covers a major part of the San Juan Mountains within the San Francisco Creek Watershed and the Rio Grande National Forest (Fig. 4).

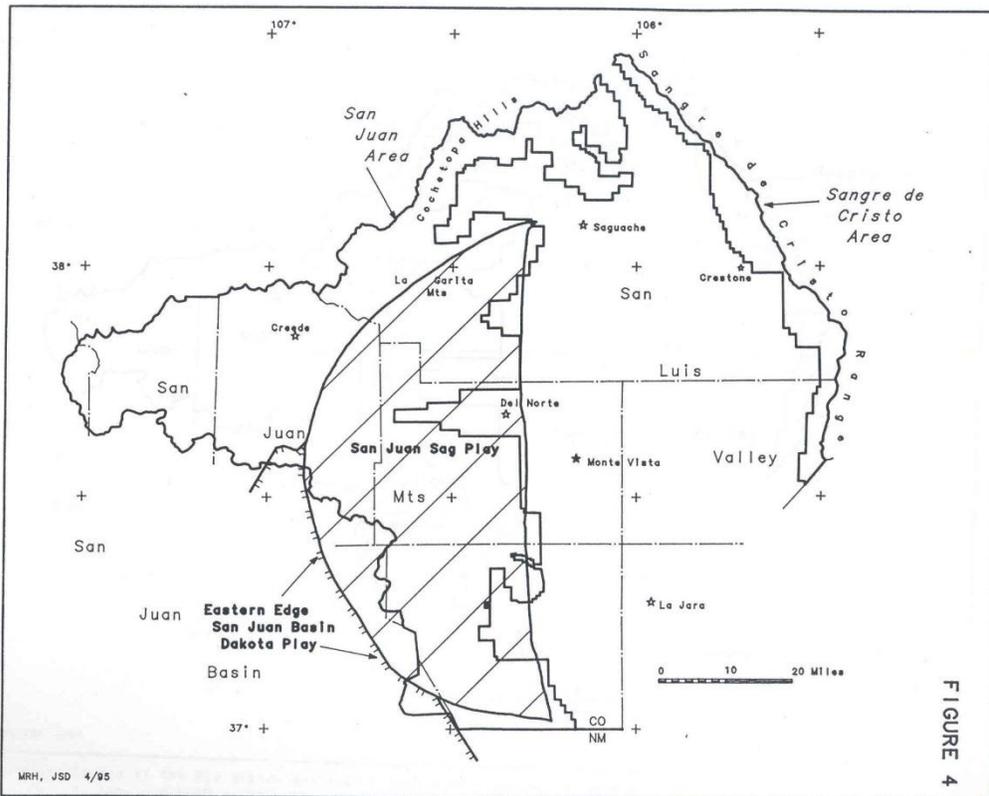


Figure 4: Map of the Rio Grande National Forest with USGS oil and gas plays.

FIGURE 5 - MAP OF USGS SAN JUAN SAG OIL AND GAS PLAY (HOLM AND DERSH, 1995)

ENVIRONMENTAL EFFECTS

PROPOSED ACTION DIRECT AND INDIRECT IMPACTS:

The proposed drill pad will be located on relatively flat to slightly rolling upland area with sparse herbaceous vegetation, no trees, and no surface water. Implementation of the proposed action would include drilling through the Conejos Formation aquifer to potentially tap into oil and gas traps from the San Juan Sag oil and gas play. The proposed action could produce hydrocarbons and contribute to the national energy supply as well as lead to beneficial subsurface information about the Conejos Formation, the San Juan Sag, and the geologic interpretation of the area. If improperly cased and cemented, the proposed action could lead to cross-contamination of water and hydrocarbon bearing aquifers. **PROTECTIVE/MITIGATION**

MEASURES:

BLM Onshore Order #2 (OO#2) requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones, lost circulation zones, abnormally pressured zones, and any prospectively valuable deposits of minerals. A review of the APD included a geologic evaluation of the potential subsurface formations that will be penetrated by the wellbore, followed by an engineering analysis of the drilling program to ensure the well construction design is adequate to protect the surface and subsurface environment, including the potential risks identified by the geologist, and all known or anticipated zones with potential risks.

The surface casing will also be deepened from 1100' to 1400' to reduce the probability of contamination as a result of the 1400' deep water wells that are located in the vicinity.

Before drilling an intermediate hole, the surface casing will be cemented in place to surface between the casing and the formation, and also be pressure-tested to verify the success of the cementing job. In addition, BLM will require increased volumes of drilling mud and fresh water be readily available on location as a preventative measure to counter any downhole pressures that could be seen. Additional storage tanks will also be available onsite to handle excess volumes of water that could be seen from the Conejos.

A BLM representative will be on site during the casing and cementing of groundwater-protective surface casing and other critical casing and cementing intervals constructed to isolate subsurface zones that present high risk for potential adverse impact to human health or safety or at high risk potential for environmental contamination.

A cement bond log will be required on the production casing (and the intermediate casing, if this is run), to ensure the quality of the cement bond between the casing and the formation. As required by BLM regulations, 50 feet of cement will be required above and below any producing interval, or any zone of interest. Given the high potential for encountering vertical and horizontal natural fractures in the San Francisco Creek #1 well that could contribute to crossflow and contamination, all casing that is run in the well will be cemented from bottom to top so that no casing will be exposed directly to the Conejos waters that are present, or to the targeted oil and gas formations that may be found at depth. Remedial cementing procedures will be required if it's determined that cementing doesn't meet BLM requirements.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

Under the no action alternative APD would be denied and no action would occur. Although, Federal subsurface minerals are encumbered with Federal oil and gas leases, which grant the lessee a right to explore and develop the leases.

PROTECTIVE/MITIGATION MEASURES: Not Applicable.

3.2.3 SOILS

AFFECTED ENVIRONMENT:

The Rio Grande County soil survey has identified the Guben-Luhon association, 0 to 20 percent slopes in the proposed project area. Soil descriptions for the Major components of this map unit (Guben (60%) and Luhon (25%)) are shown below.

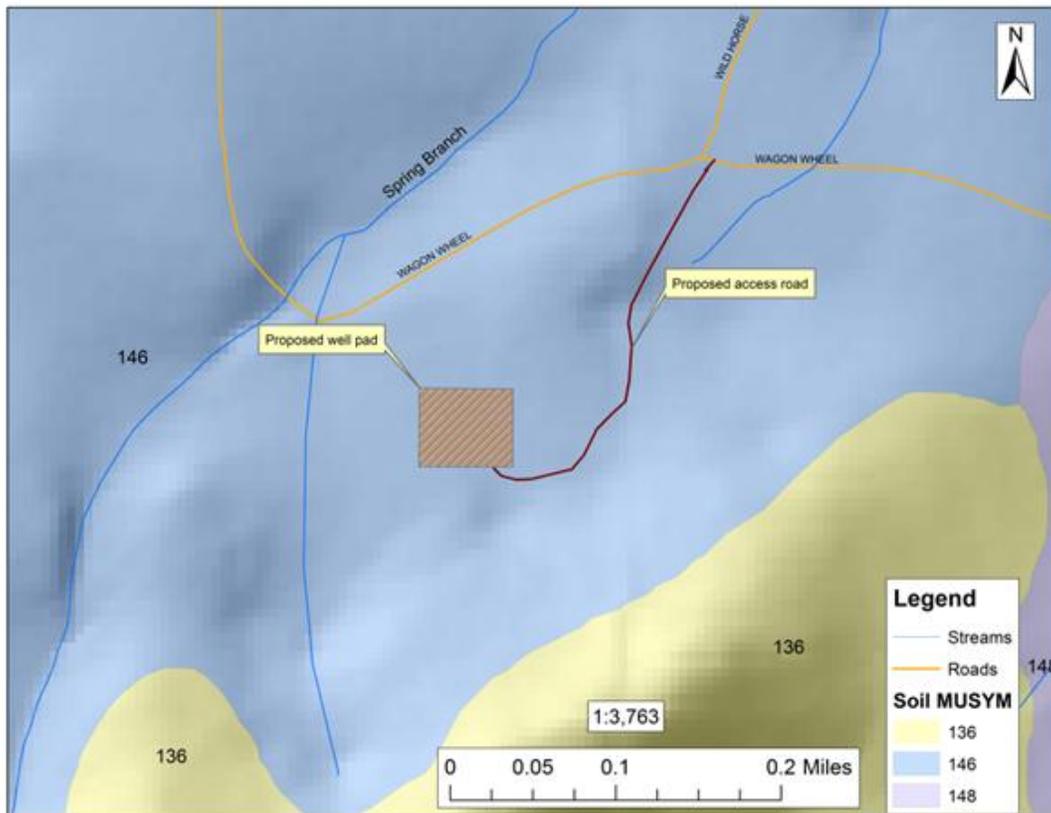


FIGURE 6 - MAP UNIT: 146—GUBEN-LUHON ASSOCIATION, 0 TO 20 PERCENT SLOPES

COMPONENT: GUBEN (60%)

The Guben component makes up 60 percent of the soil classification map unit (see figure 6). Slopes are 0 to 20 percent and the component is on alluvial fans. The parent material consists of alluvium derived from volcanic rock. Typical soil profile includes: Loam (0-8 in), Cobbly loam (8-11 in), Very cobbly loam (11-35 in), and Very gravelly sandy clay loam (35-60 in). This component has moderate fugitive dust resistance rating. Depth to a root restrictive layer is greater than 60 inches. Particle size distribution of sand, silt and clay in the A-horizon is 40, 38, and 22 percent, respectively. The natural drainage class is well drained and water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches and shrink-swell potential are low (Table 1). This soil is neither flooded nor ponded and there is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. This component is Limy Bench ecological site. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 3 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

COMPONENT: LUHON (25%)

The Luhon component makes up 25 percent of the map unit. Slopes are 0 to 15 percent and the component is on alluvial fans. The parent material consists of alluvium derived from soft sedimentary or igneous rocks. Typical soil profile includes: Loam (0-18 in), Gravelly sandy clay loam (18-30 in), and Gravelly sandy loam (30-60 in). This component has moderate fugitive dust resistance rating. Depth to a root restrictive layer is greater than 60 inches. Particle size distribution of sand, silt and clay in the A-horizon is 45, 33, and 22 percent, respectively (Table 1). The natural drainage class is well drained and water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate and shrink-swell potential is low. This soil is neither flooded nor ponded and there is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 1 percent. This component is Limy Bench ecological site. Non-irrigated land capability classification is 6e and irrigated land capability classification is 3e. This soil does not meet hydric criteria. The calcium carbonate equivalent within 40 inches, typically, does not exceed 15 percent. The soil has a slightly sodic horizon within 30 inches of the soil surface.

COMPONENT: ARGICRYOLLS (5%), LOAMY-SKELETAL LUHON (5%), AND PACHIC HAPLOCRYOLLS (5%)

These soils are minor components and soils descriptions are not provided.

The major soil components (Guben and Luhon) within the project area have moderate fugitive dust resistance rating (Table 3.10). This fugitive dust resistance rating interprets the vulnerability of a soil for eroded soil particles to go into suspension during a windstorm.

Fugitive dust could create respiratory and other health problems and cause extreme visibility reductions during severe windstorms. Based on onsite soil investigations, most of the soils examined were in properly functioning condition, meaning that soil productivity is being maintained and the soil exhibits adequate vegetation and litter cover appropriate to soil type, climate, landform, and geologic processes of the area. Sheet/rill erosion is not excessive and no soil compaction is observed which would adversely affect infiltration and permeability. No active gullies and pedestals are present.

TABLE 6 - SOIL PROPERTIES (MAP UNIT: 146 GUBEN-LUHON ASSOCIATION, 0 TO 20 PERCENT SLOPES)

Map unit symbol	Map unit name	Component name	Erosion hazard (off-road/off-trail)	Erosion hazard (road/trail)	Soil compaction resistance	Soil Restoration Potential	Hydrologic group	Erosion factors		
								Kf	Kw	T
146	Guben-Luhon association	Guben	Slight	Sever	Moderate	High	B	0.28	0.28	3
		Luhon	Slight	Moderate	Moderate	High	B	0.32	0.32	5

Map unit symbol	Map unit name	Component name	Wind erodibility group	Organic matter (%)	Soil texture (%)			Fugitive dust resistance
					Sand	Silt	Clay	
146	Guben-Luhon association	Guben	6	2.0-5.0	40	38	22	Moderate
		Luhon	4L	0.5-1.0	45	33	22	Moderate

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

The proposed action would result in up to 1.2 acres of disturbance due to the access road construction and an additional 2.3 acres of well site disturbance, which results in a total disturbance of approximately 3.5 acres. There would be a moderate to major direct impact to

these soils. The proposed development could result in soil compaction, mixing of soil horizons, soil disturbance, loss of topsoil productivity, and an increase susceptibility of the soil to wind and water erosion during initial operations associated with construction and drilling. These impacts could increase surface water runoff, soil erosion, and sediment transport and deposition. A risk of windblown erosion will continue until those disturbed lands are hardened, re-vegetated, protected by soil stabilizer, or protected by other methods. Increased runoff from the disturbed soils could cause increased erosion and gulying down gradient. In addition, soil disturbance could lead to an increase in non-native invasive weed species. Overall, with proper application and implementation of proposed interim and final reclamation measures and construction standards, offsite and onsite impacts to soils would be minor due to the gentle slopes of the project area and soil productivity would not be considerably altered.

PROTECTIVE/MITIGATION MEASURES:

The proposed access roads, drill pads, and other infrastructures would be built and reclaimed according to BLM Gold Book (www.blm.gov/bmp/goldbook.htm) standards and other APD Conditions of Approval (COAs) . No additional mitigation measures would be required.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

Under this alternative, there would be no new construction. There would be no direct or indirect impact to soils, risk of increased runoff, or risk of increased erosion in the proposed project area.

PROTECTIVE/MITIGATION MEASURES: Not Applicable.

FINDING ON THE PUBLIC LAND HEALTH STANDARD FOR UPLAND SOILS: Currently, upland soils are meeting Public Land Health Standards. The Proposed Action would cause up to 3.5 acres of soils to no longer meet standards; however with reclamation this would be reduced. With proper application of BLM Gold Book standards and other Conditions of Approval (COAs), there would be no anticipated impacts due to the proposed action.

CUMULATIVE IMPACTS

The area around the proposed access road and drilling pad has a variety of factors effecting soils including roads, housing, livestock grazing, recreation, and other activities. Soil disturbance due to the proposed action would have additional soils impact. If economical quantities of oil and gas are found, additional wells can be expected to be drilled in the

foreseeable future could increase soils; each additional well development would cause similar minor levels of soil disturbance.

3.2.4 WATER (SURFACE AND GROUNDWATER, FLOODPLAINS)

AFFECTED ENVIRONMENT:

The project area is situated within sixth-level San Francisco Creek watershed (Hydrologic Unit Code (HUC) 130100020701). Elevation within this watershed ranges from approximately 7,850 feet in the north to over 13,203 feet in the south part of the watershed. The project site is approximately located at elevation ranging between 8,520 and 8,560 feet. Precipitation varies widely with elevation. Lower areas of the watershed receive about 10 inches and higher mountain areas receive about 40 inches of precipitation annually, with most of the rainfall events occurring in July and August. The annual precipitation within the proposed site ranges between 12 and 16 inches. In general, potential evapotranspiration exceeds precipitation on the lowland areas and the reverse is true for the high elevation areas (HRS Water Consultants, Inc. 1987).

San Francisco Creek is a perennial/intermittent stream located within the watershed. The creek is about a mile away from the proposed drilling pad and access road (Figure x). West Fork San Francisco Creek, Middle Fork San Francisco Creek and East Fork San Francisco Creek are tributaries to San Francisco Creek. These three tributaries join together to form San Francisco Creek at a location about 3.5 miles upstream from the project area. San Francisco Creek finally subs into the alluvial fan – meaning it no longer shows as surface water – before reaching the Rio Grande. There is one ephemeral drainage (Spring Branch) located west of the proposed project area. Spring Branch drains into San Francisco Creek at about 3 miles downstream from the project site. There are several ephemeral drainages within the watershed. Two unnamed small ponds are located within one mile radius of the project site. The first pond, which is perennial, is located about 0.75 miles downstream and the other pond (which is intermittent) is located 0.35 miles upstream of the project area. In addition, there are four perennial lakes located at the headwaters of San Francisco Creek (see Figure 7). San Francisco Creek is not on the States list of impaired waters, (Clean Water Act 303(d)). There are no floodplains within the proposed project area.

The project area is in the San Luis Valley portion of the Rio Grande Aquifer System.

Groundwater occurs in both the unconfined and confined aquifers. The Valley occupies a structural basin bounded by igneous, metamorphic, and sedimentary bedrock. The basin contains valley fill that consists of interbedded deposits of sand, clay, gravel, and some layers of

volcanic rocks (Brendle 2002). The general pattern of groundwater movement in the Valley is inward from the Valley's edges to the center of the valley. There are over 14,000 wells in the San Luis Valley, 2,560 of which are considered small wells. (Davey 2013, Martin, 2007). The San Luis Valley is highly dependent on groundwater resources.

DRAFT

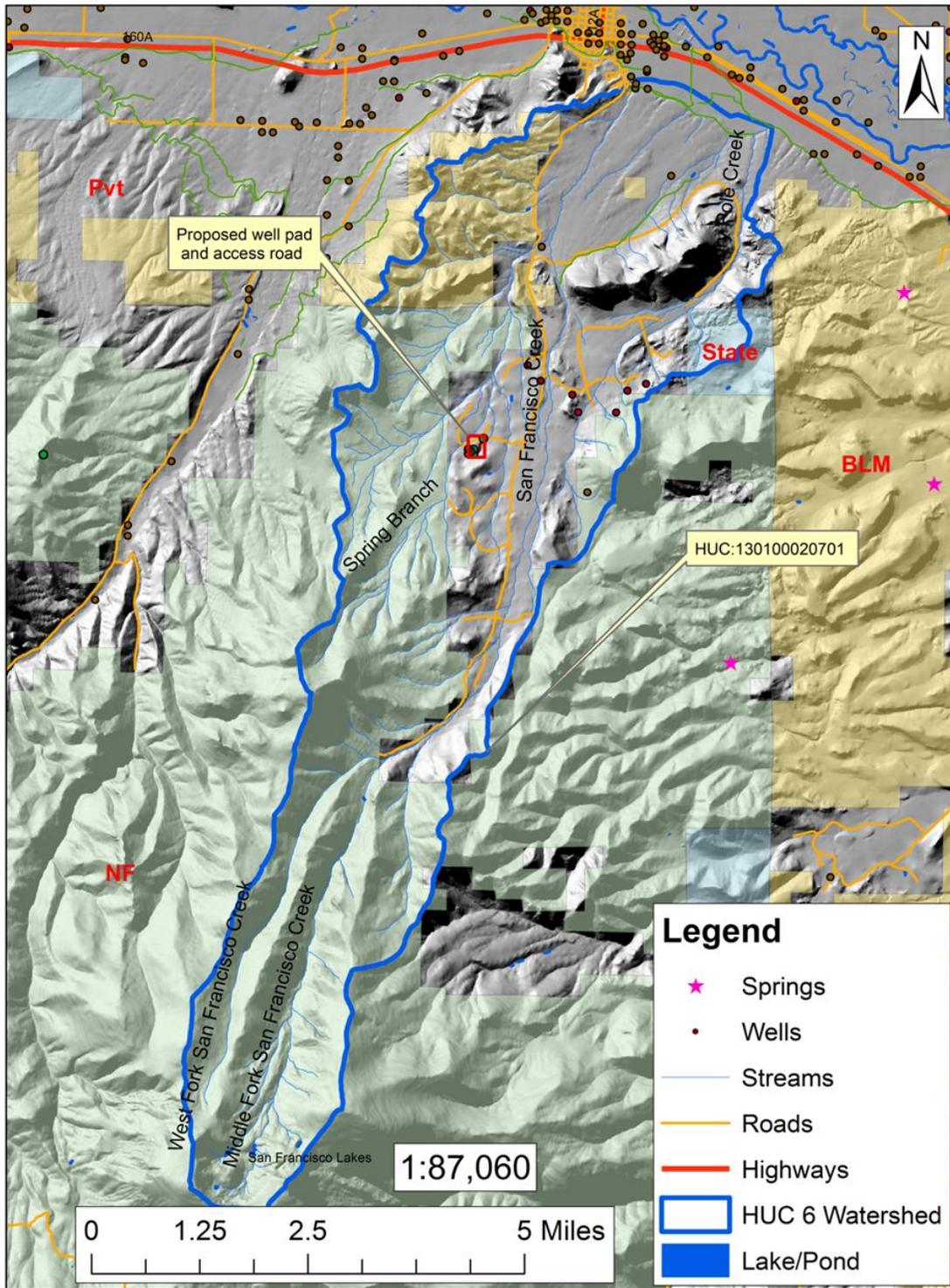


FIGURE 7 - SURFACE WATER RESOURCES WITHIN THE WATERSHED

Unconfined groundwater occurs nearly everywhere in the valley. The unconfined aquifer is recharged by infiltration of irrigation waters, leakage from canals, seepage from mountain streams that flow across permeable alluvial fans, and infiltration from precipitation. This indicates that the drainage in the project area is an unconfined aquifer recharge area. Confined groundwater occurs under nearly one-half of the San Luis Valley. The confined aquifer is recharged from precipitation in the Sangre de Cristo Mountains in the east and San Juan Mountains in the west and enters the aquifer at higher elevations (HRS 1987). The major discharge from the unconfined aquifer is through pumping wells, seepage to streams, and evapotranspiration. Discharge from the confined aquifer is by pumping wells, springs, and upward leakage through the clay series into the unconfined aquifer. Below the unconfined aquifer are a number of clay-based layers that serve to separate the unconfined aquifer from the deeper layers of sands and gravels containing water in the confined aquifer. The clay layers reduce upward movement of water from the confined aquifer creating water pressure (HRS 1987).

Along the edges of the valley there is little separation between the confined and the unconfined aquifers (CDWR, 1998). Within the project area, which is located along the edge of the valley, there may be little to no separation between the confined and unconfined aquifers. In some parts of the valley, where the confining layer is less thick and has more transmission, water from the confined aquifer leaks upward through the confining layers into the unconfined aquifer (Division 3 Water Administration, 2011). However, the relationships between the two aquifers and between the aquifers and the surface water are not well defined.

Land use in the vicinity of the proposed project area is dominated by agricultural use and low density residential area. The past and present agricultural and domestic practices, such as grazing and well drilling, altered the natural hydrology of the area. There are several wells, ditches, and diversions located within the watershed that pump and divert groundwater and surface water for domestic and agricultural uses. There is one plugged and abandoned oil/gas well, one abandoned well and 20 permitted water wells located within one mile radius of the proposed well. In addition to groundwater withdrawal from wells for agricultural and domestic uses, environmental changes and losses due to evapotranspiration have also caused long-term water-level declines in the aquifer system.

Well log (seismic-reflection section and drill-cutting) samples from Waggoner-Baldrige No 1-19 San Francisco Creek test well, located near the project area , show that the water bearing

formation at the project site is Conejos Formation. Relatively permeable material is predominant in the upper 1,700 feet to 2,000 feet of this formation in the San Juan foothills (HRS 1987). This shows that the depth of the water producing formation may reach up to 2,000 feet or more. Total dissolved solids (TDS) concentrations for the aquifer range from 141 to 292 mg/L (Mayo et al. 2007). Analytical results of the baseline sampling conducted in 2010 by Dan A. Hughes Company on wells and surface water samples within one mile radius of the project site indicate that TDS concentrations of well-water samples range from 10 to 440 mg/L. Based on the Rio Grande county hydrogeologic study (Davey et al. 2012), TDS concentration in the vicinity of San Francisco Creek area ranges between 130 and 670 mg/L. The BLM's Onshore Order requires operators to isolate freshwater-bearing and other usable water containing 5,000 ppm or less of dissolved solids and other mineral-bearing formations and protect them from contamination.

The analytical results (Unpublished data, Dan A. Hughes Company) show that neither Total Extractable Petroleum Hydrocarbons (TEPH) diesel range organics nor Total Volatile Petroleum Hydrocarbons (TVPH) gasoline range organics were detected in any of the well or surface water samples. The Rio Grande county hydrogeologic study (Davey et al. 2012), however, indicated that methane was detected at concentrations slightly above the Practical Quantitative Limit (PQL) in one of the springs within the San Francisco Creek area (the PQL is the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions). The detection of methane in this spring, according to this study, is due to biogenic gas generated from decomposition of organic material in the wetland, but not from thermogenic gas from petroleum. The static water level depth of wells within one mile radius of the project site ranges between 19.5 feet to 100.5 feet below the ground surface.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

Potential surface water impacts from the proposed action are mainly associated with the surface disturbance associated with drilling, access road construction, and related infrastructure after well completion. A total of approximately 3.5 acres would be disturbed initially with less acres remain disturbed after interim reclamation. Most impacts to surface water from the proposed activities are due to removal of vegetation and exposure of mineral soils. Specific impacts would be soil compaction caused by construction activities that would reduce the soil infiltration rates and hence increase runoff during precipitation events.

Downstream effects of the increased runoff may include changes in downstream channel morphology such as bed and bank erosion or deposition. Due to the flat nature of the topography and moderately high infiltration rate of the soil in this area, little to no new impacts to surface water quality would result from the surface disturbance due to drilling of the proposed well and construction of the access road. Additional surface water impacts could result from chemicals, or other fluids, accidentally spilled or leaked during the development process and could result in contamination of both ground and surface waters. Best management practices, such as those contained in Chapter 4 of BLM's Gold book, should be contained in the conditions of approval and surface use plan of operations to mitigate this threat.

Due to scarcity of surface water in the area, groundwater is heavily utilized for agricultural and domestic uses. Therefore, protection of this vital and vast groundwater resource is essential. During the drilling process, the proposed well would pass through usable groundwater aquifers. Potential impacts to groundwater resources could occur if appropriate cementing and casing programs are not strictly followed. The impacts could include loss of well integrity, surface spills, or loss of fluids in the drilling and completion process. It is possible for chemical additives used in drilling activities to be introduced into the water producing formations without proper casing and cementing of the well bore. Changes in porosity or other properties of the rock being drilled through can also result in the loss of drilling fluids. In such conditions, drilling fluids, as well as naturally-occurring metals and radioactive material, can be introduced into freshwater holding aquifers unless proper cementing and casing are applied.

Should hydraulic fracturing be used in the process, changes in the physical properties of the hydrocarbon producing formations due to increasing flow of water, gas, and/or oil around the well bore could occur. Hydraulic fracturing could also introduce chemical additives into the hydrocarbon producing formations and affect the mobility of naturally occurring substances in the subsurface, particularly in the hydrocarbon-containing formation. The ability of these substances to reach to groundwater or surface water as a result of hydraulic fracturing activities is a potential concern (USEPA 2011). Potential impact to groundwater could occur if fractures extend beyond the target formation and reach aquifers, or if the casing or cement around a wellbore fails under the pressures exerted during hydraulic fracturing. In addition, hydraulic fracturing requires extensive quantities of water, equipment, and vehicles, which could increase risks of accidental spills or leaks. Surface spills or releases may flow into nearby surface water and infiltrate into the groundwater.

Hydraulic fracturing materials may include water-based fluids and solid materials. Water-based fluids are used to create pressure and propagate the fracture and to carry the proppant into fracture. Proppants are solid materials that are used to keep the fractures open after pressure is reduced in the well. Volumetric composition of hydraulic fracturing fluid is 90 percent water, 9.51 percent proppant (Silica and quartz sand), and the remaining 0.49 percent are chemical additives (USEPA 2011). USEPA compiled a list of chemicals that were publically known to be used in hydraulic fracturing in 2010 but the list does not represent the entire set of chemical used in hydraulic fracturing actives (USEPA 2011). Types of chemical additives used in drilling activities may include acids, hydrocarbons, thickening agents, lubricants, and other additives. These additives are not always used in these drilling activities and some are likely to be benign. Concentrations of these additives also vary considerably since different mixtures can be used for different purposes in oil and gas development and even in the same well bore.

Currently, EPA has not made any conclusion concerning the extent of exposure to these chemicals used in hydraulic fracturing fluids or those found in hydraulic fracturing wastewater, or their potential impacts on drinking water resources (EPA, 2012). Onshore Order #2 requires that the proposed casing and cementing programs shall be conducted as approved to protect and/or isolate all usable water zones.

PROTECTIVE/MITIGATION MEASURES:

Well casing along with cement would be extended beyond the deepest fresh-water zones to insure that drilling and hydraulic fracturing fluids remain within the well bore and protect groundwater and surface water. Vertical and horizontal fractures in the formations may be encountered during drilling and could contribute to potential migration between formations. As a result, all casings that run-through the well should be cemented from bottom to top so that no casing will be exposed directly to the fresh or usable water zone, or to the targeted oil and gas formations. Shallow aquifers would be protected by extending and properly cementing the conductor casing to adequate depths.

Based on the baseline surface water and groundwater quality analytical results, subsequent water quality monitoring should be conducted within the analysis area to take immediate correcting measures and protect the vital water sources.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

If the wells are not drilled, no new impacts to either ground or surface water quality would occur.

PROTECTIVE/MITIGATION MEASURES: Not Applicable.

FINDING OF WATER QUALITY STANDARD (STANDARD 5): If drilling requirements, BMPs, mitigation measures in this and other sections of this document, and other APD COA's are properly conducted, a change to surface or ground water quality is not anticipated due to the proposed action and Standard 5 is being achieved.

CUMULATIVE IMPACTS

The area currently has a high degree of alteration due to agricultural activities, residential construction, roads, wells, ditches, and diversions. However, no producing oil/gas wells are located around the project site. At the watershed scale, the surface disturbance due to access roads and drilling pad would have minor impact on surface water. In the foreseeable future, additional wells could be drilled if economical quantities of oil and gas are found. This would add additional disturbance that would have a larger impact on surface water and groundwater resources in the future. Hydraulic fracturing could be repeated to maintain the flow of hydrocarbons to the well. The short- and long-term effects of repeated pressure treatments on well construction components such as well casing and cementing are not well understood (USEPA 2011).

3.3 BIOLOGICAL RESOURCES

3.3.1 INVASIVE PLANTS

AFFECTED ENVIRONMENT

The project area has not been inventoried by BLM for invasive non-native plant species (noxious weeds) due to the split estate and private surface. Based on site visits and site photos, the native plant community appears to be fully intact and with few invasive non-native species present.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS

The proposed action includes the use of heavy mechanized equipment to construct the pad site and road way. In addition drilling equipment and support vehicles will be coming to the site. The majority of invasive non-native species invade new sites and are established due to dirty equipment and vehicles. The dirt, oil, grease, and other contaminants collect seeds and carry them from one site to the next. This includes non-native invasive plant species. Frequently the site is carelessly taken care of, inspected, and poor reclamation occurs which allows invasive species to invade after disturbance especially when the vegetation has been removed. Invasive non-native species often do not germinate for a couple of years after the disturbance depending upon the moisture conditions. It is impossible to determine where the equipment will come from, if invasive species are present, and if the travel route includes driving in, near, or through invasive species infestations. There are many sites containing invasive species and equipment is often stored in areas where invasive species become established and are not treated. There is a likelihood of invasive non-native plant species establishment any time heavy equipment is used and the vegetation is removed from the soil.

PROTECTIVE/MITIGATION MEASURES:

The first step in preventing the invasion of non-native invasive plant species is the high pressure washing of all equipment and vehicles before arriving at the construction site. The pressure washing and inspections removing dirt and other contaminants helps prevent the spread of these species. The removal of top soil and stock piling with wind erosion prevention is the next important step and is included in the proposal. The soil needs to be evenly distributed during reclamation to provide a good soil base for reseedling. This is in the proposal. Top soil protection during stock piling from wind erosion is an important factor in the reestablishment of the vegetation community. A native seed mix at a rate of 8 pounds per acre if drilled and 16 pounds per acre if broad cast is needed in an effort to establish the plant community. Introduced grasses while cheaper to seed create many issues in a native plant community and tend to be bunch grasses that reduce soil cover. Native plants from native seed are a natural part of the plant community and will not create additional issues as introduced plants do. The authorized officer will provide recommended native seed mixes and amounts when the appropriate time for re-vegetation occurs.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

This alternative would not change the presence or absence of non-native invasive plant species. There would not be any affects and the need for reclamation would be unnecessary.

3.3.2 THREATENED, ENDANGERED AND SENSITIVE SPECIES

AFFECTED ENVIRONMENT:

Thirty-eight species of Threatened, Endangered, or sensitive (TES) wildlife may occur in the San Luis Valley and Rio Grande County (Table) based on reports from the Colorado Natural Heritage Program (CNHP), Natural Diversity Information Source (NDIS), BLM, and field observations. Fifteen species are carried forward for this analysis based on presence within or adjacent to the project area, life history information, or suitable/potential habitat within or adjacent to the project area. These species include the Gunnison prairie dog, Northern leopard frog, milk snake, bald eagle, ferruginous hawk, peregrine falcon, mountain plover, burrowing owl, Brewer’s sparrow, fringed myotis, Townsend’s big-eared bat, big free-tail bat, Rio Grande cutthroat trout, Rio Grande sucker, and Rio Grande chub.

Habitat within and adjacent to the project area is mountainous shrub steppe, which is mostly composed of sagebrush, mountain mahogany, antelope bitterbrush, and Gambel oak with an understory of graminoid species. Water bodies within the project area include San Francisco creek, one intermittent stream, an ephemeral drainage (Spring Branch), Cedar Spring, and two unnamed ponds.

ENVIRONMENTAL EFFECTS:

DIRECT AND INDIRECT EFFECTS

The proposed action would occur on privately owned surface lands within an existing subdivision. Potential impacts from this project include effects caused by construction of an access road approximately 1,320 feet in length with a 40 foot wide ground disturbance during construction, 14 foot wide completed road surface, and construction of a drilling pad approximately 2.3 acres in size. While the actual physical loss of habitat from these features is relatively small (approximately 3.5 acres), the added disturbance caused by increased human presence and equipment (and associated noise, etc.) may result in a larger disturbance footprint than the construction footprint alone. These indirect impacts would occur during construction and exploratory drilling phases, expected to take 45 days.

TABLE 7: DIRECT, INDIRECT, AND CUMULATIVE EFFECTS/IMPACTS ON THREATENED, ENDANGERED, CANDIDATE, AND SENSITIVE SPECIES FOR THE SAN FRANCISCO CREEK APD PROJECT

Species	Status	Species Occurrence	Habitat Requirements	Effects Determination: Proposed	Effects Determination: No Action

				Action	
Federally Listed Species					
Black-footed Ferret	FE	No habitat present, no known occurrence	Needs prairie dog town or complexes of >200 acres.	None	None
Canada Lynx	FT	No habitat present; no known occurrence	High elevation, mixed conifer forests	None	None
Southwestern Willow Flycatcher	FE	No habitat present; no known occurrence	Riparian areas with dense willow and understory	None	None
Mexican Spotted Owl	FE	No habitat present; no known occurrence.	Steep canyon habitats	None	None
Colorado Pike Minnow	FE	No habitat present; no known occurrence	Green, Yampa, White, Colorado, Gunnison	None	None
Razorback sucker	FE	No habitat present; no known occurrence	Deep, clear to turbid waters of large rivers and lakes	None	None
Uncompahgre fritillary butterfly	FE	No habitat present; no known occurrence	Inhabits Alpine above 12,000 feet with large patches of snow willow	None	None
BLM Sensitive Species					
<i>Amphibians and Reptiles</i>					
Northern Leopard Frog	SS, SC	Suitable habitat nearby; no known occurrence	Near permanent water with rooted veg., can travel far during wet periods	MI	NI
Milk Snake	SS, SC	Habitat present; no known occurrence	Generally below 8,000 feet, grassland and shrubland habitats	MI	NI
<i>Birds</i>					
American White	SS	No habitat present; no known occurrence	Rivers, lakes, reservoirs, and open marshes	None	None

Pelican					
Bald Eagle	SS, ST	Habitat present; no known occurrence	Winter roosting along stream corridors in large open canopy trees	MI	NI
White-faced Ibis	SS	No habitat present ; no known occurrence	Freshwater marshes, swamps, ponds, and rivers	None	None
Northern Goshawk	SS	No habitat present; no known occurrence	Deciduous, coniferous, and mixed forests; generally occurs in remote, undisturbed habitats	None	None
Ferruginous Hawk	SS, SC	Suitable habitat present; no known occurrence	Open country, sagebrush, semi-desert shrubland, and the periphery of woodlands.	MI	NI
Peregrine Falcon	SS, SC	Suitable habitat present; no known occurrence	Open habitats, especially where there are nearby nesting cliffs, as well as open forested areas	MI	NI
Mountain Plover	SS, SC	Habitat present; no known occurrence	Flat, sparsely vegetated semi-desert shrublands	MI	NI
Western Snowy Plover	SS, SC	No habitat present; no known occurrence	Alkali flats around reservoirs, migrants occur on mudflats and sandy shorelines	None	None
Burrowing Owl	SS, ST	Habitat present; no known occurrence	Open areas, found near prairie dog towns within shrub-steppe habitat	MI	NI
Black Swift	SS	No habitat present; no known occurrence	Habitats near waterfalls and wet cliffs	None	None
Brewer's sparrow	SS	Habitat present; no known occurrence	Sagebrush or other shrublands/grasslands; also within larger pinyon-	MI	NI

			juniper openings		
Gunnison Sage Grouse	SS	No habitat present; no known occurrence	Require sagebrush habitats	None	None
Yellow-billed cuckoo	SS	No habitat present; no known occurrence	Riparian areas with cottonwood and mature multi-story canopy	None	None
<i>Insects</i>					
Great basin Silverspot Butterfly	SS	No habitat present; no known occurrence	Riparian with bog violets; mostly tied to springs and bogs at low elevation (7,500 ft. or below) (Ellis, 2012)	None	None
<i>Mammals</i>					
Big Free-tailed Bat	SS	Habitat present; no known occurrence	Lower elevations in rocky canyon country, where it roosts in crevices	MI	NI
Gunnison Prairie Dog	SS	Suitable habitat present; known occurrence	Short to mid-grass prairies or shrublands, with deep, well drained soils and relatively flat slopes	MI	NI
Fringed Myotis	SS	Habitat present; no known occurrence	Pinyon-juniper and other coniferous woodlands	MI	NI
New Mexico meadow jumping mouse	SS	No habitat present; no known occurrence	Riparian habitats generally below 8,000 feet in elevation, with tall grass	None	None
North American Wolverine	SS	No habitat present; no known occurrence	Boreal forest, subarctic, and alpine tundra	None	None
Townsend's Big-eared Bat	SS, SC	Habitat present; no known occurrence	Shrublands, pinyon-juniper woodlands, and open montane forests; highly associated with caves and mines	MI	NI

Swift Fox	SS	No habitat present; no known occurrence	Grassland and short-grass prairie; ecotones with pinyon-juniper shrublands	None	None
<i>Fish</i>					
Rio Grande sucker	SS, SE	Habitat nearby, known occurrence within 1 mile	Clear, cool-water stream habitats	MI	NI
Rio Grande Chub	SS, SC	Suitable habitat within 1 mile; no known occurrence	Clear, cool-water stream habitats	MI	NI
Rio Grande Cutthroat Trout	SS, SC	Habitat nearby, known occurrence within 1 mile	Clear, cool-water stream habitats with rocky substrates	MI	NI
<i>Plants</i>					
Fragile Rockbrake	SS	No habitat present; no known occurrence	Moist wooded slopes and rock outcrops	None	None
Pale blue-eyed grass	SS	No habitat present; no known occurrence	Wetlands, fens , and riparian corridors limited occurrence in Saguache County	None	None
Ripley's milkvetch	SS	No habitat present; no known occurrence	Sagebrush and ponderosa pine at elevation below 8,250 ft.	None	None
Rock loving neoparrya	SS	No habitat present; no known occurrence	Rock shelves or in cracks of volcanic cliffs and rock outcrops	None	None
Slender spiderflower	SS	No habitat present; no known occurrence	Saline/alkaline soils at edge of wetlands	None	None

*Species Status:

FE = Federally Endangered FT = Federally Threatened SE = State Endangered ST = State Threatened
 SC= State Species of Concern SS = BLM Sensitive Species

*Determinations for Federally listed (T&E) species:

NE = No Effect; NLAA = Not Likely to Adversely Affect; BA= Beneficial Affect, MA = May Affect; LAA= Likely to Adversely Affect; None= Species/habitat is not present.

**Determinations for State Sensitive Species: NI = No Impact; MI= May Impact (May Impact Individuals, but is not likely to cause a trend towards Federal listing or loss of viability in the planning area); BI= Beneficial Impact; LI= Likely Impact (Likely to result in a trend towards Federal listing or a loss of viability in the planning area); None= Species habitat is not present or species is known not to be present

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

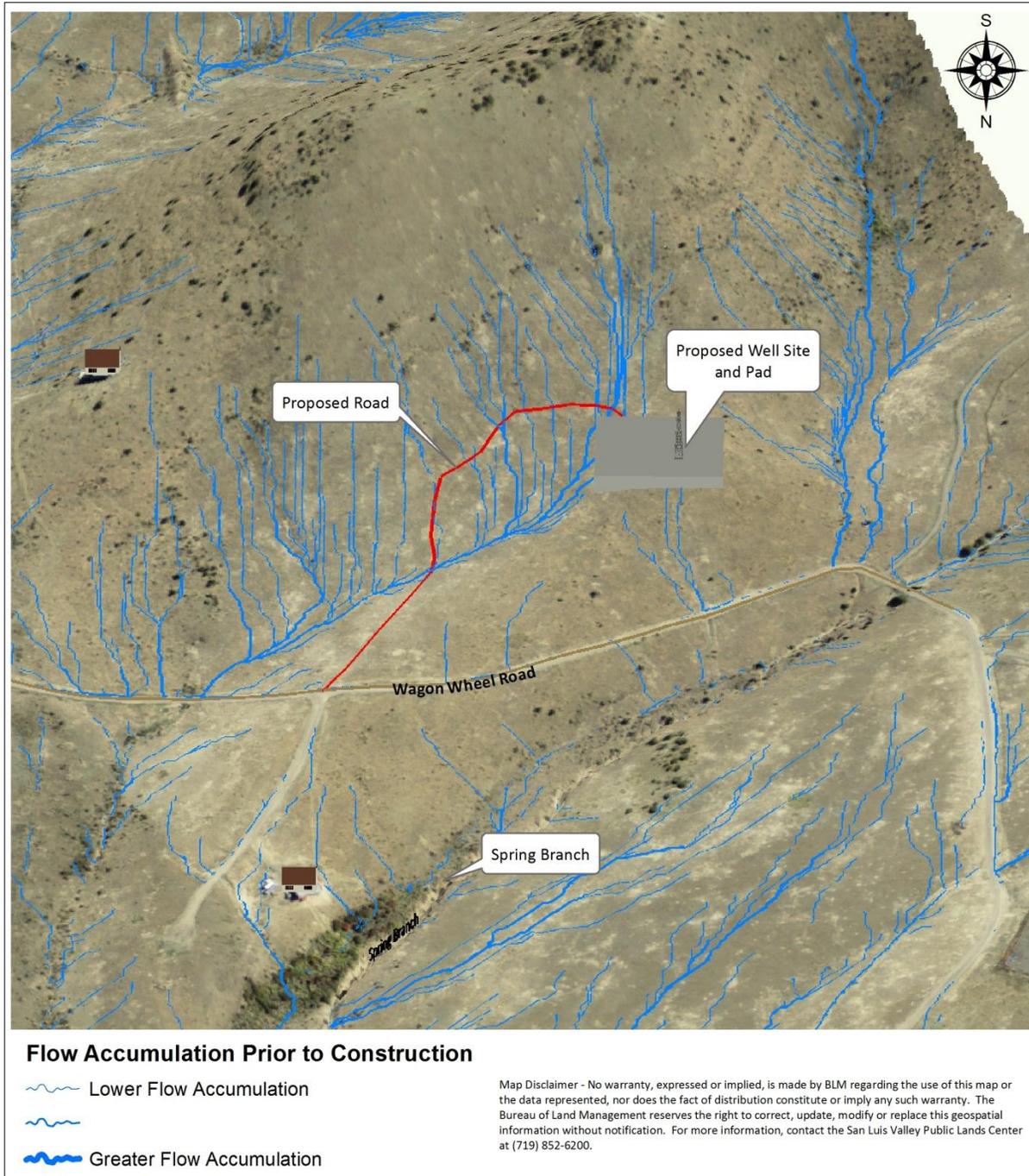
DIRECT AND INDIRECT IMPACTS:

During construction and exploratory drilling operations, TES species in the area would be exposed to higher levels of vehicular traffic (increasing the risk of vehicular collisions) and heavy equipment operations during construction activities. TES species could be injured or killed during access road and well pad construction, and other activities. Small or less mobile animals such as reptiles, amphibians, and rodents would be most susceptible to direct injury or mortality from well pad development activities and increased vehicular traffic. Construction of the well pad and road would also result in the direct loss of habitat, although the total acres lost will remain relatively small (approximately 3.5 acres). Soil compaction and damage to vegetation in the area from construction activities or the potential introduction and or expansion of noxious weeds on the site in these disturbed areas will reduce the quality and quantity of available habitat. The spread of noxious weeds makes it more difficult for native species to reestablish in disturbed areas, threatening the continued existence of native species on the site. This can affect wildlife by reducing habitat quality and species diversity, thereby affecting foraging and breeding behavior.

Construction activities could also damage or destroy prairie dog burrows, and soil compaction can degrade burrow habitats (USDI Fish and Wildlife Service, 1990).

Groundwater is connected to important surface water habitats (perennial and ephemeral stream channels, ponds and springs) that species rely on. Although the exact interactions between surface and groundwater may not be fully understood, it is likely that any effects to groundwater in this area would impact the wildlife resource. Therefore, protection of groundwater source is essential. During the drilling process, the proposed well would pass through groundwater bearing formations.

FIGURE 8: FLOW ACCUMULATION OF EPHEMERAL DRAINAGES ADJACENT TO THE PROPOSED WELL SITE. THIS FIGURE ALSO DEPICTS SLOPE OF THE AREA SURROUNDING THE PROPOSED WELL SITE (MAP NOT TO SCALE DUE TO 3D IMAGE).



TES birds or bats may be burned or killed by exhaust vents, heater-treaters, flare stacks, etc., if openings are used as a perch or roost site while in operation.

Other potential effects to TES species include increased disturbance from human activity and noise at the site. While TES species in the area may be habituated to some amount of human activity that is present in the subdivision, it is likely that the increased activity and noise during the construction and exploratory drilling stages would result in increased avoidance of this area and displacement of species during that time. Many species are sensitive to increases in noise, and the increased stress may cause disruption of breeding, migration, wintering, foraging, and other behavioral activities. Low-level noise from operation of the well could have long-term effects on TES species, causing them to avoid the area, or potentially putting chronic stress on animals, affecting their energy budget, reproduction, and long term survival (Radle, 2007).

Acoustical cues play a dominant role in sexual communication, territory defense, habitat quality assessment, and predator-prey interactions (Barber, Crooks, & Fristrup, 2009), and may be impacted by low-level noise. For example, noise could interfere with bats that use echolocation to detect prey species. Studies have documented substantial changes in foraging and anti-predator behavior, reproductive success, density, and community structure in response to noise (Kight & Swaddle, 2011). Because reproductive success and nutritional condition can decrease due to increased energy expenditures resulting from physical response to disturbance, it is important to minimize these effects through the implementation of mitigation measures/ COAs, which require restricting disturbance during the period when animals are most stressed. In addition, it is possible that displaced animals will not return to these affected areas, potentially resulting in loss of habitat. Sawyer et al. (2006; 2009) observed displacement of mule deer from areas undergoing energy development with no indication of re-occupancy of abandoned areas. Because the surrounding area will still provide relatively intact, important habitat, because the size of this development is relatively small (even while accounting for the larger “impact footprint”), and because the disturbance is only projected to last 45 days, the effects of this potential loss of habitat and likelihood of population-level effects on species is likely minimal.

MITIGATION MEASURES

- Construct, modify and maintain all open-vent exhaust stacks to prevent birds and bats from entering, and to discourage perching, roosting and nesting (required by the Migratory Bird Memorandum of Understanding between BLM and USFWS, and required by Executive Order 13186 for the protection of Migratory bird species).

- Conduct visual raptor nest surveys within a 0.5 mile radius of the project site, prior to any ground disturbing activities to protect any existing raptor nest sites, and to be in compliance with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186.
- If any raptor nests are located, apply appropriate timing limitation.
- If prairie dogs are present within the project area, the operator should incorporate special modifications to facility siting, design, construction, and operation to minimize involvement of prairie dog burrow systems (Colorado State Stipulation for Prairie dog).
- Abide by special daily and seasonal activity restrictions on construction, drilling, product transport, and service activities during Gunnison prairie dog reproductive period (March 1 – June 15; Colorado State stipulation for prairie dog).
- Provide in-kind compensation for habitat loss and/or displacement of Gunnison prairie dog (e.g., special on-site PD habitat enhancement) when appropriate (Colorado State Stipulation for Prairie dog).
- Conduct winter eagle roost survey. No surface use is allowed within 0.5 miles of an active winter roost site between November 15 and March 15 (Colorado State Stipulation for Bald eagle).
- Well casing along with cement would be extended well beyond fresh-water zones to insure that drilling and hydraulic fracturing fluids remain within the well bore and do not enter groundwater (Onshore Order # 2).
- Use closed loop system to prevent accidental exposure of drilling fluids to any wildlife species. No open pits or storage tanks are allowed (in Drilling Plan).
- Ensure an adequate spill response plan is in place to address surface spill at well site as well as a spill that could occur while hauling to and from well site (Condition of Approval).

CUMULATIVE EFFECTS

The Proposed Action, while limited in size and duration and therefore limited in terms of its local impact on TES species, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for TES species. Issues affecting available habitat in the San Luis Valley include agricultural developments, housing developments, impacts from several years of intense drought conditions, fire suppression, and recreation activities all resulting in overall habitat loss or reduction in habitat quality and increased stress on TES species. Activities potentially affecting TES species in the project area include habitat fragmentation from subdivision development including home construction, road and driveway construction, fences, increased human and pet presence, grazing and decrease forage and water levels due to drought. With the implementation of the proposed mitigation measures, operational requirements, and BMPs, it is anticipated that environmental consequences of

displacement of wildlife species and loss of habitat would affect some individuals, but not impact the continued viability of any species.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT EFFECTS: Under the No Action Alternative, the proposed project would be denied and there would be no impacts to TES species.

CUMULATIVE EFFECTS: As there would be no direct or indirect effects under this alternative, there would therefore be no cumulative effects.

FINDING ON THE PUBLIC LAND HEALTH STANDARD FOR THREATENED & ENDANGERED SPECIES:

Overall, the project area is generally meeting the land health standards for TES species; however, this project adds incrementally to longer term and larger-scale habitat concerns, This project is not expected to compromise continued landscape level maintenance of the standard.

3.3.3 WILDLIFE AQUATIC

AFFECTED ENVIRONMENT:

The project area is situated within sixth-level San Francisco Creek watershed (HUC: 130100020701). The project site is located at an elevation ranging between 8,520 and 8,560 feet. The amount of precipitation within the proposed site ranges between 12 and 16 inches.

San Francisco Creek, and its tributaries Middle Fork and West Fork are the only perennial streams located within the watershed. There are a total of 17.8 miles of perennial streams, 87.4 miles of intermittent streams and 51.8 miles of ephemeral stream channels within the watershed. San Francisco Creek is approximately 1 mile east of the proposed drilling pad and access road. One intermittent stream channel is located within 648 feet of the project area, and an ephemeral drainage (Spring Branch) located 470 feet of the project area. Spring Branch drains into San Francisco Creek about 3 miles downstream of the project site. Downstream of the project area, surface flows in San Francisco Creek disappear from the surface and drain into the alluvial fan before reaching the Rio Grande. Two unnamed small ponds are located within a one mile radius of the project site. The first pond, which is perennial, is located about 0.75 miles downstream and the other pond (which is intermittent) is located 0.35 miles upstream of the proposed drilling pad. Cedar Spring is located 1.8 miles from the project site.

The Project Area is in the San Luis Valley portion of the Rio Grande Aquifer System (see section 3.42 for a complete description). As described in the Water Quality section, there is a connection between the groundwater aquifers and surface waters, although it may not be well understood. Aquatic wildlife near the project area include amphibians and fish utilizing both perennial habitats as well as intermittent and ephemeral habitats when they are wet. Amphibians using nearby stream and pond habitats could include tiger salamanders, chorus frogs, and northern leopard frogs (BLM sensitive species). Fish species of concern that occur or potentially occur in San Francisco Creek include Rio Grande sucker (state endangered and BLM sensitive species), , and Rio Grande cutthroat trout (candidate for Federal listing as threatened or endangered and BLM sensitive species).

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

As described in the Water Quality section, fish and amphibians are highly sensitive to changes in water quality, and sedimentation can cause a variety of detrimental effects including egg suffocation, decreased macroinvertebrate production affecting food resource availability, etc. However, these effects are expected to be minimal, given the small size of the disturbed area, the relatively flat nature of the topography and moderately high infiltration rate of the soil in this area.

Should a spill occur during transport to or from the site, it is possible to contaminate aquatic systems. In wetter conditions, these channels could be occupied by amphibians or fish. Mortality of individuals could occur if the spill was large enough and not contained immediately. The spill response plan should be followed to mitigate this threat.

Groundwater is connected to important surface water habitats (perennial and ephemeral stream channels, ponds and springs) that wildlife species rely on, particularly aquatic wildlife species. It is likely that any effects to groundwater in this area would impact the wildlife resource.

PROTECTIVE/MITIGATION MEASURES:

The following measures are recommended to minimize effects to aquatic wildlife from this project. Some recommendations, as noted, were included in drilling plans or as lease stipulations.

- Well casing along with cement would be extended well beyond fresh-water zones to insure that drilling and hydraulic fracturing fluids remain within the well bore and do not enter groundwater (Onshore Order # 2).
- Use closed loop system to prevent accidental exposure of drilling fluids to any wildlife species. No open pits or storage tanks are allowed (in Drilling Plan).
- Ensure an adequate spill response plan is in place to address surface spill at well site as well as a spill that could occur while hauling to and from well site (Condition of Approval).

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS: Under the No Action Alternative there would be no impacts to aquatic wildlife species.

CUMULATIVE EFFECTS: As there would be no direct or indirect effects under this alternative, there would therefore be no cumulative effects.

PROTECTIVE/MITIGATION MEASURES: Not applicable.

FINDING ON THE PUBLIC LAND HEALTH STANDARD FOR PLANT AND ANIMAL COMMUNITIES:

Overall, the project area is generally meeting the land health standards for aquatic wildlife communities; however, this project adds incrementally to longer term and larger-scale habitat concerns. This project is not expected to compromise continued landscape level maintenance of the standard.

3.3.4 WILDLIFE TERRESTRIAL

AFFECTED ENVIRONMENT:

San Francisco Creek #1 proposed is within a small subdivision. This subdivision is made up of approximately 33 lots. The subdivision homes, associated roads and driveways, and fences create a fragmented habitat. The habitat can generally be described as mountainous shrub steppe zone in the foothills of the nearby San Juan mountain range. Present plant community consists of sagebrush, antelope bitterbrush, mountain mahogany and Gambel oak, with an understory of intermixed cool and warm season grasses (including western wheat grass and blue grama) and forbs. The area borders a high elevation pinyon juniper woodland on the north. Public lands lie within about 0.25 miles of the proposed well site. Wildlife species utilizing this area include pronghorn antelope, mule deer, elk, Gunnison’s prairie dog, various rodents and a variety of birds, including raptors such as red-tailed hawk and golden eagles. The project area, as mapped by Colorado Parks and Wildlife, is within the mule deer overall, winter,

severe winter and winter concentration areas; elk overall, winter, severe winter and winter concentration areas; pronghorn overall range; bald eagle winter range; black bear overall range, and mountain lion overall range. Although no raptor nests were found on the site, raptors were seen foraging in the general vicinity (Western Land Services, Inc, 2012) The subdivision, associated roads and fences create a fragmented habitat.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

This proposed action would occur on privately owned surface lands within an existing subdivision. Direct impacts are those that result in loss of habitat, such as construction of drill pads, access roads and associated facilities, or loss of individual animals. The project will include construction of an access road approximately 1,320 feet in length with a 40 foot wide ground disturbance during construction, 14 foot wide completed road surface, and construction of a drilling pad approximately 2.3 acres in size. While the actual physical loss of habitat from these features is relatively small (approximately 3.5 acres), the added disturbance caused by humans and equipment (and associated noise, etc) at this site would result in a larger impact footprint than the disturbance footprint alone. These indirect impacts would occur during construction and exploratory drilling phases, expected to take 45 days. During construction and exploratory drilling operations, wildlife in the area would be exposed to higher levels of vehicular traffic (increasing the risk of vehicular collisions), and increased human activity and noise at the site. While wildlife in the area may be habituated to some amount of human activity that is present in the subdivision, increased activity and noise during the construction and exploratory drilling stages may result in increased avoidance of this area and possible displacement of wildlife. This is expected to be a temporary displacement, as all activities are expected to be completed within 45 days.

Increased energy expenditures resulting from physical response to disturbance can decrease reproductive success and nutritional condition of wildlife. It is important to minimize these effects through the implementation of mitigation measures/stipulations, which require restricting disturbance during the period when animals are most stressed. In addition, it is possible that displaced animals will not return to these affected areas, potentially resulting in loss of habitat. Sawyer et al. (2006; 2009) observed displacement of mule deer from areas undergoing energy development with no indication of re-occupancy of abandoned areas. Because the surrounding area will provide relatively intact, important habitat, and because the

size of this development is relatively small the effects of this potential loss of habitat can be kept to a minimum with the implementation of mitigation measures. It is important to note that these mitigation measures include an expanded “no activity” timing limitation. In order to minimize effects to big game and other wildlife species from this project, the lengthened timing limitation (as recommended by Colorado Parks and Wildlife), is necessary to protect these species that are undergoing additional stress during the winter months as a result of diminished habitat quality due to the continued drought.

PROTECTIVE/MITIGATION MEASURES:

The following measures are recommended to minimize effects to wildlife from this project. Some recommendations, as noted, were included in drilling plans or as lease stipulations; in those cases, measures are requirements rather than recommendations.

- Use closed loop system to prevent accidental exposure of drilling fluids to any wildlife species. No open pits or storage tanks are allowed (in Drilling Plan).
- Enclose entire pad with three tiers of one-ton straw bales to dampen noise during drilling (in Drilling Plan). Use certified weed-free straw bales to minimize spread of noxious weeds to adjacent private lands or public lands (BLM recommendation).
- All equipment will be power washed prior to entering the site to help mitigate the spread of noxious weeds. The operator would monitor for and treat any noxious weeds along the right-of-way and on the well pad (in Drilling Plan).
- Protect big game winter range by allowing no surface use (excluding operation and maintenance of production facilities) from December 15 to March 31 (Lease Stipulation SL-01).

CUMULATIVE EFFECTS:

The Proposed Action, while limited in size and therefore somewhat limited in terms of its local impact on wildlife, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for wildlife species. Factors that have contributed to changes in wildlife habitats are numerous. Some issues in the San Luis Valley include agricultural developments, housing developments, impacts from several years of intense drought conditions, fire suppression, and recreation activities all resulting in overall habitat loss or reduction in habitat quality for wildlife species. In addition, crucial winter habitats and migratory corridors are known to be limiting factors on big game populations in western Colorado and other high mountain areas of the western United States (Sawyer et al. 2009, Bishop et al. 2009, Bartman et al. 1992). This area, important as both winter range and a possible movement corridor, is already experiencing high levels of stress caused by factors

listed above as well as habitat fragmentation. With the implementation of the proposed mitigation measures, operational requirements, and BMPs, it is anticipated that environmental consequences of displacement of wildlife species and loss of habitat would affect some individuals, but not impact the continued viability of any species.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS: Under the No Action Alternative, the proposed project would be denied and there would be no impacts to big game, raptors or other terrestrial wildlife species.

CUMULATIVE EFFECTS: As there would be no direct or indirect effects under this alternative, there would therefore be no cumulative effects.

PROTECTIVE/MITIGATION MEASURES: Not applicable.

FINDING ON THE PUBLIC LAND HEALTH STANDARD FOR PLANT AND ANIMAL COMMUNITIES:

Overall, the project area is generally meeting the land health standards for terrestrial communities; however, this project adds incrementally to longer term and larger-scale habitat concerns. This project is not expected to compromise continued landscape level maintenance of the standard.

3.3.5 MIGRATORY BIRDS

AFFECTED ENVIRONMENT:

Migratory birds are species that in the course of their annual migration traverse certain parts of the United States, Canada, Mexico, Russia, or Japan. This includes long-distance migrants, short-distance migrants, and resident species. The Migratory Bird Treaty Act of 1918 makes it unlawful to pursue, hunt, kill, capture, possess, sell, purchase, or barter any migratory bird, including the feathers or other parts, nests, eggs, or migratory bird products. In addition, Executive Order 13186 (signed in 2001) makes federal agencies responsible for implementing bird conservation principles by ensuring that any federal action evaluates its effects upon migratory bird populations. The project and surrounding area provides suitable habitat for a variety of migratory birds (USDI Fish and Wildlife Service, 2008) that may utilize the vegetation communities during the nesting period (typically May 15 – July 15) or during spring and fall migrations.

TABLE 8: MIGRATORY BIRD TABLE: USFWS BIRDS OF CONSERVATION CONCERN (BCC) FOR BCR 16 AND THEIR STATUS WITHIN THE PROJECT AREA

Species	Associated Habitat Types(s)	Occurrence in Analysis Area/ Adjacent Lands
American Bittern	Wetlands	No
Bald Eagle	Lakes and rivers	No
Ferruginous Hawk	Grassland, Mountain Shrub, Semi-Desert Shrubland, Sagebrush Shrublands	Possible
Golden Eagle	Agricultural, Grassland, Cliff/Rock/Talus	Documented
Peregrine Falcon	Agricultural, Pinyon-Juniper, Spruce-Fir, Ponderosa Pine, Cliff/Rock/Talus, Wetlands	Possible
Prairie Falcon	Agricultural, Grassland, Semi-Desert Shrubland, Cliff/Rock/Talus	Possible
Gunnison's sage-grouse	Mountain Shrub, Sagebrush Shrubland, Low Elevation Riparian	No
Snowy Plover	Wetlands	No
Mountain Plover	Agricultural, Grassland, Semi-Desert Shrubland, Sagebrush Shrubland	Possible
Long-billed Curlew	Shorelines	No
Willow Flycatcher	Willow-Riparian	No
Juniper Titmouse	Pinyon-Juniper Woodlands	No
Yellow-billed Cuckoo	Low Elevation Riparian, Wetlands	No
Flammulated Owl	Aspen, Ponderosa Pine, Mixed-Conifer, Spruce-Fir	No
Burrowing Owl	Grassland, Semi-Desert Shrubland, Sagebrush Shrubland	Possible
Veery	Dense riparian thickets, willow-riparian	No*
Lewis's Woodpecker	Ponderosa Pine, Low Elevation Riparian	No

Gray Vireo	Oak woodlands/scrub	No*
Pinyon Jay	Pinyon-Juniper, Ponderosa Pine	No
Bendire's Thrasher	Semi-Desert Shrubland	Possible
Black Rosy Finch	Spruce-fir forest; alpine	No*
Brown-capped Rosy Finch	Nests above timberline in alpine zone in cliffs, crevices; also utilizes spruce-fir forest	No
Cassin's Finch	Primarily spruce-fir, but also mixed-conifer forest	No
Grace's warbler	Ponderosa pine	No*
Brewer's sparrow	Sagebrush Shrubland	Possible
Grasshopper Sparrow	Grasslands	Possible
Chestnut-collared longspur	Shortgrass Prairie	No*

* Excluded from analysis because the species does not occur or has very rare migratory occurrence in the SLV.

A review of the migratory bird table indicates that five species on the BCC List for BCR 16 are excluded from analysis because they do not occur or are considered accidental within the San Luis Valley and will therefore not be affected by the proposed actions. These species include the veery, gray vireo, black rosy finch, Grace's warbler, and chestnut collared longspur. Species that do not occur or do not have habitat present in the San Francisco Creek Well #1 area are those labeled "No" in the Occurrence column of the table above.

The information provided in the migratory bird table indicates that nine species designated as Birds of Conservation Concern (BCC) for BCR 16 could breed in or near the analysis area or migrate through the general vicinity. Most migratory bird use in the San Luis Valley is limited to the summer period due to the harsh fall, spring and winter months. Most birds arrive during late spring (April/ May) and migrate from the area in early fall (August/ September). The species present during summer are most likely breeding and rearing young. Most species on the BCR 16 list follow this migration pattern; however, a few species are present during the wintertime. Resident species that spend all or part of the winter in the San Luis Valley include the ferruginous hawk, golden eagle, Gunnison's sage-grouse, burrowing owl, peregrine falcon, prairie falcon, Lewis's woodpecker, and pinyon jay. Of these winter resident species

ferruginous hawk, golden eagle, peregrine falcon, prairie falcon, and burrowing owl have potential year-round habitat present in the project or adjacent areas.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

A primary concern for migratory birds from the proposed action involves direct and indirect effects of surface disturbing activities of the grassland/ shrubland habitat and subsequent activity associated with well development. Disturbance from these activities includes the potential for destruction of nests, loss of life of the individual due to collisions with vehicles or by other means, and disturbance to individual birds that can cause them to abandon a nest or an area during the nesting season which would lower individual reproductive success and fecundity (the number of offspring a female produces over her lifetime). Although the immediate project area may not provide nesting habitat for raptors, potential raptor nesting could occur within 0.5 miles of the project area. Thus, nesting raptors could be impacted by increased human disturbance, construction activities, etc. during this period, as they will forage in excess of 0.5 miles from an active nest. Human activity and habitat alteration in close proximity to raptor nests has been shown to adversely impact nest (Colorado Parks and Wildlife, 2002; Andersen, Rongstad, & Mytton, 1990; Richards & Clinton, 1997; White & Thurow, 1985; Holmes, Knight, Stegall, & Craig, 1993; Oxley, Fenton, & Carmondy, 1974)

Direct impacts are those that cause disturbance to individual birds or take of a nest. Direct impacts of construction of well pad and access road and increased human and vehicular activity during well drilling operations may include disturbance to roosting and foraging birds. Take of an individual or a nest is possible with construction and operation activities, through vehicle collisions or inadvertent crushing of individuals or nests during the construction phase. In addition, sources of water may congregate several species of migratory birds that require open water. Migratory birds may be burned or killed by exhaust vents, heater-treaters, flare stacks, etc., if birds perch at the opening while in operation.

Indirect impacts are those that remove habitat from use or availability to migratory birds in the present or future, or cause indirect impact to individuals. Indirect impacts include the loss of productive grassland/shrubland habitat and disturbance to soils and vegetation that may have provided nesting habitat. Birds will likely avoid the area during times of high human/vehicle activity, resulting in a temporary loss of usable habitat. While migratory birds utilizing this site

may be habituated to some amount of human activity that is present in the subdivision, it is likely that the increased activity and noise during the construction and exploratory drilling stages would result in increased avoidance of this area and displacement of species during that time. Many species are sensitive to increases in noise, and the increased stress may cause disruption of breeding, migration, wintering, foraging, and other behavioral activities. Low-level noise from operation of the well could have long-term effects on species, causing them to avoid the area, or potentially putting chronic stress on animals, affecting their energy budget, reproduction, and long term survival (Radle, 2007). Acoustical cues play a dominant role in sexual communication, territory defense, habitat quality assessment, and predator-prey interactions (Barber, Crooks, & Fristrup, 2009), and may be impacted by low-level noise. Studies have documented substantial changes in foraging and anti-predator behavior, reproductive success, density, and community structure in response to noise (Kight & Swaddle, 2011). Because reproductive success and nutritional condition can decrease due to increased energy expenditures resulting from physical response to disturbance, it is important to minimize these effects through the implementation of mitigation measures/stipulations, which require restricting disturbance during the period when animals are most stressed.

Displaced birds will likely utilize undisturbed habitats in the area adjacent to the project site. With the implementation of proposed mitigation measures and stipulations, it is anticipated that the environmental consequences of these direct and indirect effects on migratory birds may affect some individuals, but would not impact the continued viability of any species.

PROTECTIVE/MITIGATION MEASURES:

The following measures are either requirements laid out in the Drilling Plan, or required in order to be in compliance with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186.

- Use closed loop system to prevent accidental exposure of drilling fluids to migratory birds. No open pits or storage tanks are allowed (in Drilling Plan).
- Limit traffic effects to migratory birds by concentrating traffic (truck drivers driving in tandem and hauling water to the site all at once; Drilling Plan).
- Enforce a timing limitation from May 15 thru July 15 for any surface disturbing activities to protect migratory bird nesting and brood rearing, and to be in compliance with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186.
- Construct, modify and maintain all open-vent exhaust stacks to prevent birds and bats from entering, and to discourage perching, roosting and nesting to be in compliance

with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186.

- Conduct visual raptor nest surveys within a 0.5 mile radius of the project site, prior to any ground disturbing activities to protect any existing raptor nest sites, and to be in compliance with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186 If any raptor nests are located, apply appropriate timing limitation.

CUMULATIVE EFFECTS

Cumulative impacts include the effect of future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration. Factors that have contributed to changes in wildlife habitats are numerous. Some issues in the San Luis Valley include agricultural developments, housing developments, impacts from several years of intense drought conditions, fire suppression, and recreation activities all resulting in overall habitat loss or reduction in habitat quality for migratory birds that use the area for foraging, nesting, roosting and for migratory stop-over habitat, and may contribute as cumulative effects under the Proposed Action.

The Proposed Action, while limited in size and limited in terms of its local impact on migratory birds, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for all wildlife species.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS: Under the No Action Alternative, the proposed project would be denied and there would be no impacts to migratory birds.

CUMULATIVE EFFECTS: As there would be no additional cumulative effects under this alternative.

PROTECTIVE/MITIGATION MEASURES: Not applicable

3.4 HERITAGE RESOURCES AND HUMAN ENVIRONMENT

3.4.1 CULTURAL RESOURCES

AFFECTED ENVIRONMENT:

This analysis of the affected environment for cultural resources is focused within the split estate oil and gas lease of 34 acres owned by Dan Hughes CO. The subsurface is federally

owned and administered by the BLM's San Luis Field Office (SLVFO). The BLM has the legal responsibility to identify and consider the effects to cultural properties on private land that result from a federal action. In this case, the federal action is the issuance of a BLM permit to explore for oil and gas on this lease parcel. This federal action constitutes an undertaking according to the National Historic Preservation Act of 1966 (NHPA), as amended, and requires that ground-disturbing activities be surveyed for cultural resources in order to comply with the Act's implementing regulations under the Secretary of the Interiors Standards and Guidelines for Historic Preservation (36 CFR 800). In 2010, a 100% (Class III) cultural resource inventory of the 34 acres was conducted by Metcalf Archaeological Consultants Inc. A detailed analysis was documented in a Section 106 NHPA report by the contractor. The BLM reviewed and sent the report to the Colorado State Historic Preservation Office (COSHPO) for concurrence.

AFFECTED ENVIRONMENT:

Cultural resources in this area are within the Rio Grande Basin cultural context (Martorano et.al. 1999). Both historic and prehistoric resources are present in the general vicinity. Prehistoric resources consist of those sites associated with aboriginal peoples such as open lithic scatters, rock shelters, rock art panels, stone habitation sites, and game blind structures. Historic resources consist of sites associated with farming and ranching expansion such as homesteads, railroads, and stock driveways. Given the distance to permanent water, the potential for significant archaeological resources is low. Ground visibility is extremely good due to shallow rocky soils and scant vegetation. Local bedrock is exposed across the parcel with evidence of poor soil development.

The pre-field (Class I) analysis for cultural resources utilized the records of the COSHPO, the cultural resource atlas of the SLVFO, all relevant Cultural Resource Management (CRM) reports, General Land Office (GLO) plat maps, aerial photographs and historic photographs. The Class I assessment indicates no historic and prehistoric sites have been previously recorded within the project area. One cultural property (5RN1069) was identified within the well pad and access road location (refer to BLM Report Number 12-RG-DNFO-001) during the 2010 cultural resource inventory. It consists of a sparse lithic scatter with no diagnostic tools. Contract archaeologists conducted ten shovel probes to test for buried cultural deposits with negative results. The site is recommended as *not eligible* to the National Register for Historic Places (NRHP). The site does not retain integrity and artifacts are resting on a deflated surface, or have been re-deposited downslope, and are clearly in a secondary context. There is no evidence to suggest that site 5RN1069 retains potential for an intact buried cultural level or that it is likely to provide information important to prehistory. The COSHPO concurred with the Determination of

Effect from the contractor and the BLM on May 23, 2012. Further management of the site is not required.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

Direct and Indirect Impacts: Oil and gas drilling and attendant activities can have negative direct and indirect impacts to cultural resources. The cumulative effect is that over time fewer archaeological resources will be available to learn about past human lifeways, to study changes in human behavior through time, and to interpret the past to the public. Site documentation can mitigate the loss of cultural resources.

According to the 2004 revised regulations [36 CFR 800.4(d) (1)] for Section 106 of the *National Historic Preservation Act* (16 U.S.C. 470f) the recommended determination for the proposed action is ***no historic properties effected*** if the Discovery and Education Stipulation is implemented. Under the implementing regulations of Section 106 of the National Historic Preservation Act (36 CFR 800), sites considered *not eligible* to the NRHP may be directly affected once adequately recorded, evaluated, and concurrence is received from the State Historic Preservation Office regarding NRHP eligibility.

PROTECTIVE/MITIGATION MEASURES: None required

DISCOVERY AND EDUCATION STIPULATION:

1. Any cultural and/or paleontological resources (historic or prehistoric site or object) discovered by the BLM or any person working on the BLM's behalf, on public or Federal land shall be immediately reported to the Authorized Officer, Field Manager-BLM, Saguache, Colorado. The BLM or its contractors shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine the appropriate actions to follow to prevent the loss of significant cultural or scientific values. The BLM will be responsible for the cost of the evaluation. Any decision as to proper mitigation measures to be taken will be made by the Authorized Officer after consultation with the Colorado State Historical Preservation Office.
2. Collection or disturbance of artifacts and other archaeological, historical, and paleontological materials by the BLM, its representatives, contractors, or employees, shall not be allowed. Offenders shall be subject to prosecution under the appropriate State and Federal laws..

NO ACTION ALTERNATIVE

Direct and Indirect Impacts: Under the *No Action* Alternative, the potential for direct effects to cultural resources from oil and gas drilling would be negligible. If there is no federal action, then there is no undertaking, as defined in 36 CFR 800.2(o), for Section 106 of the National Historic Preservation Act (16 U.S.C. 470f). The determination would be *No Effect*.

PROTECTIVE/MITIGATION MEASURES: Not applicable.

3.4.3 VISUAL RESOURCES

AFFECTED ENVIRONMENT:

BLM has a responsibility for managing the visual (scenic) resources of public lands as established by the National Environmental Policy Act which requires that measures be taken to “assure for all Americans...aesthetically pleasing surroundings,” and FLPMA which states that “public lands will be managed in a manner which will protect the quality of scenic values of these lands.” Visual Resources Management (VRM) is a system for minimizing the impacts of surface-disturbing activities and maintaining scenic values for the future. BLM uses the procedures and methods of its VRM system to support decision-making for planning activities and reviews of proposed actions on BLM lands and for making recommendations on non-Federal surface lands where BLM administers the sub-surface mineral estate (also known as ‘Split Estate’).

Since the proposed well pad and portions of the access road and related infrastructure would be constructed on private land, Federal lease terms regarding visual concerns are not applicable. Visual resource values for private lands are only protected by landowner discretion.

The Proposed Action would take place on Split Estate property that is consistent with VRM Class III. The area is characterized by small ranchettes of various acreages in a residential subdivision. The natural landscape is typified by open hillsides of mostly native vegetation, consisting primarily of grasses and shrubs with the occasional pinyon or juniper tree. The objective of VRM Class III, as defined in the BLM’s Handbook H-8410-1 – Visual Resource Inventory (BLM 1986), is described below.

- *The objective of VRM Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the*

casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The visual resource analysis area includes the proposed well pad located on private land south of the Town of Del Norte. This viewshed is important to the people who live, work and recreate in the area. The Proposed Action would be located in the viewer's foreground /middle ground, within 5 miles from Rio Grande County Road 13. BLM guidance states that lands with high visual sensitivity are those within five miles of a primary travel corridor and of moderate to very high visual exposure, where details of vegetation and landform are readily discernible and changes in visual contrast can be easily noticed by the casual observer. The visual impact analysis for this project is based on the views from two Key Observation Points (KOPs) representing the viewing angle and direction with the highest frequency of viewers as seen primarily from Rio Grande County Road 13 (San Francisco Creek).



FIGURE 9– KEY OBSERVATION POINT 1 (KOP 1)

KOP 1 is located at the intersection of Wagon Wheel Rd. and Wild Horse Road, looking southwest at the immediate site of the Proposed Action.

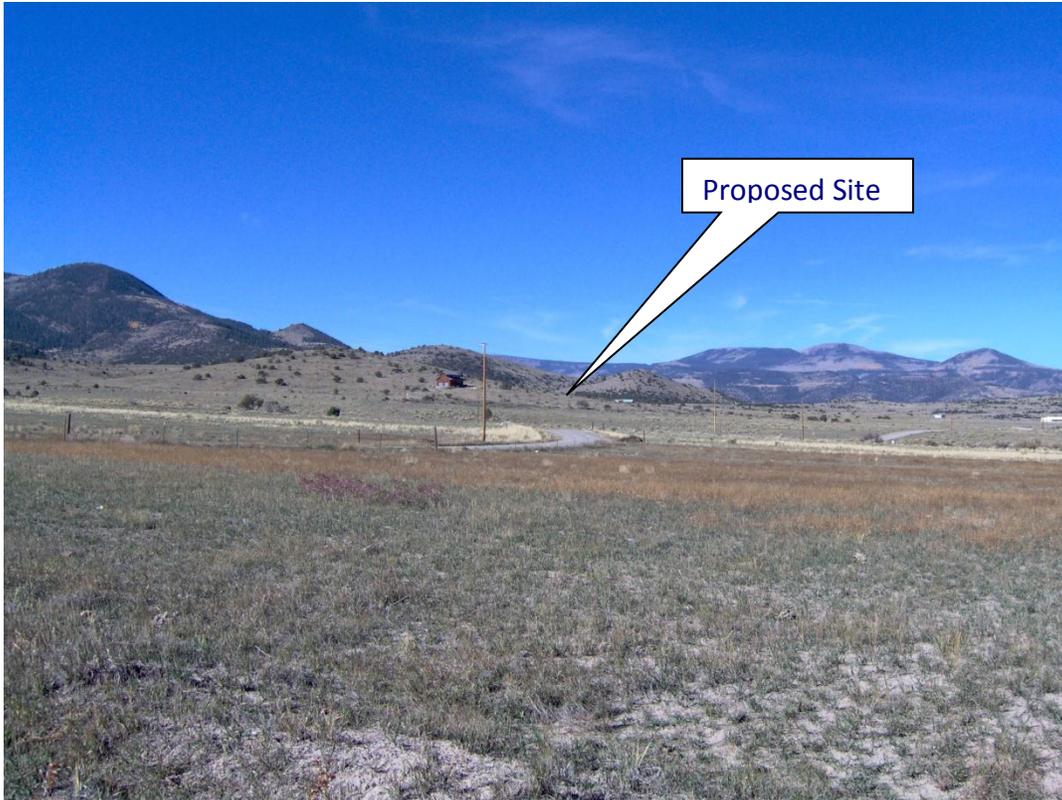


FIGURE 10 – KEY OBSERVATION POINT 2 (KOP 2)

KOP 2 is located approximately .6 miles east of the project site at the intersection of CR 13 and Wagon Wheel Road and represents the location where the project would be most visible to viewers traveling south along CR 13.

In addition to analyzing the potential impacts of the Proposed Action immediately within the project area from KOPs, a viewshed analysis was conducted to determine the effects of the project from observation or visibility corridors near the project area. Using these two methods, the most dominant characteristics of the Proposed Action were identified and the results aided in defining which mitigation techniques would be the most effective.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

The proposed action would create short-term visual impacts (such as light pollution, dust, and increased traffic), due to construction, drilling and completion activities that would occur within

the project area. The existing landscape would be changed by the introduction of contrasting elements within the landscape in the form of new lines, colors, forms, and textures. Such visual changes would be most evident during construction and completion activities. Once the well is put into production, the pad is re-contoured and vegetation re-established, and infrastructure is painted to blend in with the general surroundings, the overall visual contrast and texture of the site during the daytime would be expected to adequately blend in with the surrounding landscape. Utilizing shrouded, downward lighting (as described in the Application for Permit to Drill by the Proponent) would also help to minimize night time light pollution and Loss of the Night Sky.

The proposed action would occur entirely on private lands. The pad would be 250' x 300', with a maximum cut of 6.95 feet on the southern edge and a maximum fill of 8.43 feet at the northeast corner. The total disturbance would be 3.22 acres. The pad would be most visible from the east as seen from Rio Grande County Road 13. The areas with the largest amount of cut/fill occur in locations that would be visible from each of the KOPs, however, the distance from the observable areas, the angle of view, and the scale as seen by the viewer would help to minimize the actual visible surface disturbance.

PROTECTIVE/MITIGATION MEASURES:

All new or modified fluid mineral developments (i.e. well pads, access routes, pipelines, etc.) on private property are recommended to adhere to BLM's Best Management Practices (BMP) for Fluid Minerals Management. The BMP describes numerous design techniques that can be used to reduce the visual impacts from surface-disturbing projects. Design fundamentals and strategies are interrelated, and when used together, can help resolve visual impacts from proposed activities or developments.

DESIGN FUNDAMENTALS. General design principles are those that can be used for all forms of activity or development, regardless of the resource value being addressed. Applying the three fundamentals of 1) proper siting or location, 2) reducing unnecessary disturbance, and 3) repeating the elements of form, line, color, and texture help solve most visual design problems.

DESIGN STRATEGIES. These include more specific activities that can be applied to address visual design problems and mitigate the visual impact of range activities, improvements and other related infrastructure and include the following:

- Color Selection - Color selection typically has the greatest impact on the visual success or failure of projects. Strong contrasts in color, such as unpainted drilling infrastructure,

create easily recognizable visual conflicts in the landscape and require mitigation. Color selection should be made in accordance with the BMP criteria and utilizing BLM's Environmental Color Selection Chart. Recommended color for painting infrastructure in the Dan A. Hughes San Francisco Creek APD #1 project is "**Covert Green.**"

- Earthwork - The scars left by excessive cut and fill activities during construction often leave long-lasting negative visual impacts. This is especially true of activities that disturb the highly mineralized soils of the arid west. There are a number of ways to reduce the contrasts created by earthwork construction, including proper siting or location and linear alignment. Fitting fluid mineral developments to the existing landforms in a manner that minimizes the size of cuts and fills, and in accordance with the criteria defined in the BMP, will greatly reduce visual impacts from earthwork.
- Vegetative Manipulation - Plan, design, and locate vegetative manipulation in a scale which retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural features.
- Structures – Structures should be designed to repeat the form, line, color and texture of the surrounding landscape. Locate structural improvements to meet Scenic Quality Objectives (i.e. utilize natural features to screen from view structures such as drill rigs, access roads, pipelines, etc.).
- Reclamation/Restoration – An important aspect of any surface-disturbing activity is to reclaim and restore the landscape to the greatest extent possible after project completion. The objectives of restoration and reclamation include 1) reducing long-term visual impacts by decreasing the amount of disturbed area and 2) blending the disturbed area into the natural environment while still providing for project operations.
- Linear Alignment Design Considerations - Proper siting and location of developments can often contribute significantly to the reduction of line and color impacts, making other measures either unnecessary, less costly and easier to accomplish. Considerations for fluid mineral developments include:
 - Place fluid mineral structures (such as drill rigs, access roads, pipelines, etc.) within the surrounding vegetation or in locations that minimize visibility, when such a location is feasible.
 - Minimize the amount of disturbance within view of travel ways (including roads, trails, and recreation areas).

No ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

Under the No Action Alternative, none of the components of the Proposed Action would be approved. The existing visual environment would remain in its current condition, with no new or additional impacts to scenic quality or visual resources.

PROTECTIVE/MITIGATION MEASURES: Not applicable.

3.4.4 SOCIOECONOMIC

AFFECTED ENVIRONMENT:

For the purposes of this analysis, the area of influence is determined to be Rio Grande County. Currently there are no active wells in the county, either on federal or private mineral estate. The immediate area of drilling is in a rural subdivision south of Del Norte, Colorado.

TABLE 9 - RIO GRANDE COUNTY DEMOGRAPHICS

	Rio Grande	Colorado
Population 2011*	11,915	5,118,000,000
Population 2010	11,982	5,026,000,000
Population 2000	12,413	4,301,000,000
Population Change 2000-2010	-3.5 %	16.9 %
Housing Vacancy Rate	28.6 %	9.8 %

* 2011 Estimates from Colorado State Demography Office

San Luis Valley Statistical Profile

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

The act of drilling a well for the production of fluid minerals will lead to several social and economic effects of varying impacts and duration. The fundamental effect of this action is to meet the demand for fossil fuel. This well will employ a small number of personnel; it is assumed the employees will be brought in from outside the local area, as the specialists required for drilling are not likely to be found in the local communities. The bulk of these employees will likely remain for only a short duration, as the drilling and completion stages of the well are expected to take between 6-12 weeks. A portion of the non-specialized goods and

services required by the drilling company will likely be acquired in the local area. These local purchases will help to support local businesses and workers.

The proposed action is also expected to increase governmental revenue, in terms of federal, state, and local treasuries. If fluid minerals can be produced profitably, the royalties on any mineral sales will be 12.5%. This royalty amount will be divided evenly between the federal government and the State of Colorado. Colorado's share of the royalties are further subdivided between state and local governments, with approximately 25% of Colorado's share disbursed directly to local governments, with the possibility of further state grants and loans to help mitigate any negative effects of mineral development. A share of state severance taxes on the depletion of mineral estate will be disbursed to the local communities, as well as an expected increase in local ad valorem tax revenue due to the drilling and production equipment. In addition, there will be an expected increase in sales tax revenue due to the purchases of local goods by the company and the temporary employees.

However, if the well does not prove to be profitable, then the majority of these theoretical revenue streams will be nonexistent. If the well is profitable, then there is a very strong likelihood of further drilling activity in the area in the future.

Possible negative social and economic effects are primarily due to the intensive nature of the drilling and completion stages of well development. The development will be noticeable to a broad area, in particular to other residents of the subdivision in which it is planned. Stipulations on drilling will mitigate some, but not all of these concerns, including fugitive dust, traffic, noise, and nighttime lighting. These negative impacts are expected to damage the scenic and rural nature of the area, though these effects are expected to be short-term in nature. The number of employees required for this action and the duration of the drilling activities is not expected to have any noticeable effect on the local community.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS:

Under the no action alternative, drilling would not occur. It is assumed that the demand for fluid minerals would be met by other fossil fuel sources, either domestic or foreign, or renewable energy sources. None of the social and economic effects, either positive or negative, will occur.

PROTECTIVE/MITIGATION MEASURES: Not Applicable

3.4.5 ENVIRONMENTAL JUSTICE

AFFECTED ENVIRONMENT:

Rio Grande County does have environmental justice communities, as the population of Hispanic residents is meaningfully greater than the state average.

TABLE 10 - RIO GRANDE COUNTY DEMOGRAPHICS (RACE, ETHNICITY, INCOME)

	Rio Grande	Colorado
White, Non-Hispanic	56.8 %	70.3 %
Hispanic	41.6 %	20.4 %
Poverty Rate, by Family	12.5 %	8.7 %
Unemployment, 2011	9.3 %	8.3 %

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

None of the impacts of the proposed action would be expected to fall disproportionately on minority populations in the area.

3.4.6 WASTES, HAZARDOUS OR SOLID

AFFECTED ENVIRONMENT:

It is assumed that conditions associated with the proposed project site are currently clean and that no contamination is evident. No hazardous material, as defined by 42 U.S.C. 9601 (which includes materials regulated under CERCLA, RCRA and the Atomic Energy Act, but does not include petroleum or natural gas), will be used, produced, transported or stored during project implementation.

ENVIRONMENTAL EFFECTS

PROPOSED ACTION

DIRECT AND INDIRECT IMPACTS:

Possible contaminant sources associated with the drilling operations are:

- Storage and use of petroleum, oil and lubricants
- General hazardous substances and/or chemicals
- Concrete washout water
- Drilling water, mud and cuttings

PROTECTIVE/MITIGATION MEASURES:

The following mitigation will assist in reducing potential spills and resulting groundwater and/or soil contamination:

- All Above Ground Storage Tanks will need to have secondary containment and constructed in accordance with standard industry practices or an associated Spill Prevention Control and Countermeasures plan in accordance with State regulations (if applicable).
- If drums are used, secondary containment constructed in accordance with standard industry practices or governing regulations is required. Storage and labeling of drums should be in accordance with recommendations on associated MSDS sheets, to account for chemical characteristics and compatibility.
- Appropriate level of spill kits need to be onsite and in vehicles.
- All spill reporting needs to follow the reporting requirements outlined in NTL-3A.
- No treatment or disposal of wastes on site is allowed.
- All concrete washout water needs to be contained and properly disposed of at a permitted offsite disposal facility.

NO ACTION ALTERNATIVE

DIRECT AND INDIRECT IMPACTS: None

PROTECTIVE/MITIGATION MEASURES: None

3.5 Cumulative Impacts Summary

The proposed project area is located at an elevation of approximately 8,500 feet within the San Francisco Creek Watershed; a tributary to Rio Grande river. The project area is within the mountainous shrub steppe zone and is composed of sagebrush, mountain mahogany and Gambel oak intermixed with native and invasive graminoid species and forbs. The project area borders a high elevation pinyon-juniper woodland. The surrounding area is primarily National Forest System lands and private land. Historical land use was primarily ranching and much of the area was utilized for sheep and cattle grazing.

Past actions that have affected resource conditions include sheep and cattle grazing, recreation, road construction, home construction, and infrastructure associated with the subdivision (roads, driveways, fences, signs, wells, water diversions). On-going drought in the region has also affected plant communities and water availability. Intense grazing combined with drought conditions has resulted in reduced habitat quality for wildlife and aquatic resources. Subdivision development has resulted in fragmented habitat and increased presence of people, vehicles, and pets within critical big game winter range.

The project area is within a small rural subdivision made up of approximately 33 lots that are 35-40 acres in size. There is no commercial or industrial development in the area. On-going development or build-out of the subdivision combined with residential development in the Pinos Creek watershed to the west will continue to fragment habitat, increase disturbance to wildlife, and potentially affect surface water quality due to increased erosion and sedimentation. Impacts associated with the proposed action will be additive to past and present actions and are described by resource:

Air Quality and Climate. The addition of the infrastructure needed to construct and drill the additional pad and well would have a cumulative impact to the area's air quality; however, given the existing level of development in the area and current air quality, the proposed well's impact would be very minor. The surface area is controlled by the company as to exclude public access, and as such, ambient air quality should not be affected by the proposed action. In the long term, if economical quantities of oil and gas are found, additional wells can be expected to be drilled on Federal, State, and private lands. This could result in a larger impact to air quality in the future. The area has only minimal oil and gas development and according the COGCC database all of the areas well locations that have been drilled are dry and abandoned. Short term emissions and the lower likelihood of actual production make the probability of significant cumulative effects unlikely. With respect to GHG emissions, the following predictions were

identified by the EPA for the Mountain West and Great Plains region (<http://www.epa.gov/Region8/climatechange/pdf/ClimateChange101FINAL.pdf>):

- The region will experience warmer temperatures with less snowfall.
- Temperatures are expected to increase more in winter than in summer, more at night than in the day, and more in the mountains than at lower elevations.
- Earlier snowmelt means that peak stream flow will be earlier, weeks before the peak needs of ranchers, farmers, recreationalist, and others. In late summer, rivers, lakes, and reservoirs will be drier.
- More frequent, more severe, and possibly longer-lasting droughts will occur.
- Crop and livestock production patters could shift northward; less soil moisture due to increased evaporation may increase irrigation needs.
- Drier conditions will reduce the range and health of ponderosa and lodge pole pine forests, and increase the susceptibility to fire.
- Grasslands and rangelands could expand into previously forested areas.
- Ecosystems will be stressed and wildlife such as the mountain line, black bear, long-nose sucker, marten, and bald eagle could be further stressed.

If these predictions are realized as mounting evidence suggests is already occurring, there could be impacts to resources within the region. For example, if global climate change results in a warmer and drier climate, increased particulate matter impacts could occur due to increased windblown dust from drier and less stable soils. Warmer temperatures with decreased snowfall could have an impact on a particular plants ability to sustain itself within its current range. An increased length of growing season in higher elevations could lead to a corresponding variation in vegetation and change in species composition. These types of changes would be most significant for special status plants that typically occupy a very specific ecological niche. Cool season plant species' spatial ranges are predicted to move north and to higher elevations, and extinction of endemic threatened or endangered plants may be accelerated. Invasive plant species would be more likely to out-compete native species.

Increases in winter temperatures in the mountains could have impacts on traditional big game migration patterns. Due to loss of habitat, or due to competition from other species whose ranges may shift northward, the population of some animal species may be reduced. Warmer

winters with less snow would impact the Canada lynx by removing a competitive advantage they have over other mountain predators. Earlier snowmelt could also have impacts on cold water fish species that occupy streams throughout the planning area. Climate change could affect seasonal frequency of flooding and alteration of floodplains, which could impact riparian conditions. More frequent and severe droughts would have impacts on many wildlife species throughout the region as well as vegetative composition and availability of livestock forage in some areas. Climate change could increase the growing season within the region, however, so longer growing season in theory would result in more forage production provided there is sufficient precipitation. Drier conditions could have severe impacts on forests and woodlands. This could leave these forests and woodlands more susceptible to insect damage and at higher risk of catastrophic wildfires. Increased fire activity and intensity would increase greenhouse gas emissions.

Soils. The area around the proposed access road and drilling pad has a variety of factors effecting soils including roads, housing, livestock grazing, recreation, and other activities. Soil disturbance due to the proposed action would have additional soils impact. If economical quantities of oil and gas are found, additional wells can be expected to be drilled in the foreseeable future could increase soils; each additional well development would cause similar minor levels of soil disturbance.

Water Quality. The area currently has a high degree of alteration due to agricultural activities, residential construction, roads, wells, ditches, and diversions. However, no producing oil/gas wells are located around the project site. At the watershed scale, the surface disturbance due to access roads and drilling pad would have minor impact on surface water. In the foreseeable future, additional wells could be drilled if economical quantities of oil and gas are found. This would add additional disturbance that would have a larger impact on surface water and groundwater resources in the future. Hydraulic fracturing could be repeated to maintain the flow of hydrocarbons to the well. The short- and long-term effects of repeated pressure treatments on well construction components such as well casing and cementing are not well understood (USEPA 2011).

Threatened & Endangered Species. The Proposed Action, while limited in size and duration and therefore limited in terms of its local impact on TES species, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for TES species. With the implementation of the proposed mitigation measures, operational requirements, and BMPs, it is anticipated that environmental consequences of displacement of wildlife species and

loss of habitat would affect some individuals, but not impact the continued viability of any species.

Wildlife. The Proposed Action, while limited in size and therefore somewhat limited in terms of its local impact on wildlife, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for wildlife species. Crucial winter habitats and migratory corridors are known to be limiting factors on big game populations in western Colorado and other high mountain areas of the western United States (Sawyer et al. 2009, Bishop et al. 2009, Bartman et al. 1992). This area, important as both winter range and a possible movement corridor, is already experiencing high levels of stress. With the implementation of the proposed mitigation measures, operational requirements, and BMPs, it is anticipated that environmental consequences of displacement of wildlife species and loss of habitat would affect some individuals, but not impact the continued viability of any species.

Migratory Birds. Cumulative impacts include the effect of future State, tribal, local, or private actions that are reasonably certain to occur in the action area under consideration. Factors that have contributed to changes in wildlife habitats are numerous. Some issues in the San Luis Valley include agricultural developments, housing developments, impacts from several years of intense drought conditions, fire suppression, and recreation activities all resulting in overall habitat loss or reduction in habitat quality for migratory birds that use the area for foraging, nesting, roosting and for migratory stop-over habitat, and may contribute as cumulative effects under the Proposed Action.

The Proposed Action, while limited in size and limited in terms of its local impact on migratory birds, adds to the cumulative effect of habitat loss and decreased habitat quality that is occurring in this general area for all wildlife species.

Cultural Resources. Oil and gas drilling and attendant activities can have negative direct and indirect impacts to cultural resources. The cumulative effect is that over time fewer archaeological resources will be available to learn about past human lifeways, to study changes in human behavior through time, and to interpret the past to the public. Site documentation can mitigate the loss of cultural resources.

CHAPTER 4 - CONSULTATION AND COORDINATION

4.1 List of Preparers and Participants

NAME	TITLE	AREA OF RESPONSIBILITY
Leon Montoya	Realty Specialist	Lands and Realty, Waste Hazardous or Solid
Nicolas Sandoval	Geologist	Minerals, Oil and Gas
Mark Swinney	Range Management Spec.	Range, Vegetation, Farmland
Brain Garcia	Law Enforcement Ranger	Law Enforcement
Melissa Garcia	Wildlife Biologist	Aquatic Wildlife, Terrestrial Wildlife, Migratory Birds
Jim Jaminet	Fire Management Officer	Fire Management
Gill Lucero/Sue-Swift Miller	Wildlife Biologist	Wetlands/Riparian
Melissa Shawcroft	Range Management Spec	Range, Vegetation, Farmland, Weeds
Sean Noonan	Outdoor Recreation Planner	Recreation, Wilderness, LWCs, Visual, ACEC, W&S Rivers, Transportation
Negussie Tedela	Hydrologist	Air Quality, Hydrology, Water Quality/Rights, Soils
Joe Velasquez	Cadastral Surveyor	Cadastral Survey
Eduardo Duran	Natural Resource Specialist	Air Quality, Invasive Plants, T&E Species, Farmlands
Mark Swinney	Resource Advisor	Invasive Plants

Paul Minow	Fuels Natural Resource Specialist	Fire Ecology, Fuels Management
Martin Weimer	NEPA Coordinator	Environmental Justice, Noise, Economics
Angie Krall (FS)	Archaeologist	Cultural Resources / Native American

4.2 Tribes, Individuals, Organizations, or Agencies Consulted

In March of 2013, the BLM notified the following tribal entities regarding this proposed action: Navajo Nation, Jicarilla Apache Tribe, Ohkay Owingeh, Taos Pueblo, San Ildefonso Pueblo, Pueblo of Santa Ana, Santa Clara Pueblo, Pueblo de Cochiti, Santo Domingo Pueblo, Picuris Pueblo, Pueblo of Nambe, Kewa Pueblo, Southern Ute Indian Tribe, Uintah and Ouray Tribe, Ute Mountain Ute Tribe, and the Hopi Tribe.

Colorado Parks and Wildlife

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DRAFT



Appendix A Conditions of Approval

United States Department of the Interior
BUREAU OF LAND MANAGEMENT
San Luis Valley Field Office
46525 Colorado Highway 114
Saguache, Colorado 81149



CONDITIONS OF APPROVAL FOR APPLICATION FOR PERMIT TO DRILL

San Francisco Creek #1

A Copy of These Conditions Must Be Furnished to Your

Field Representative to Insure Compliance

DRILLING DEADLINE: This approval is good for **two years**, or until lease expiration date, whichever occurs first. A onetime two-year APD extension may be requested if needed.

The primary District Office contacts are:

<i>Contact</i>	<i>Title</i>	<i>Telephone</i>	<i>E-mail</i>
Marvin Hendricks	Petroleum Engineer (PE)	(719) 269-8566 cell (719) 429-1307	mhendric@blm.gov
Paul Morgan	Petroleum Engineer Tech. (PET)	(719) 269-8533 cell (719) 429-3188	pmorgan@blm.gov
Andrew Archuleta	SLV FO Manager, Authorized Officer (FM)	(719)-655-6115 cell (719)-588-5567	aarchule@blm.gov
Paul Tigan	SLV FO Asst. Manager (AFM)	(719) 852-6274 cell (719)849-3106	pdigan@blm.gov

Notification Requirements: Pre-Drilling/Pre-Completion

<i>Description</i>	<i>Contact</i>	<i>Action</i>	<i>Contact Method</i>
Location Construction	AFM	Forty-Eight (48) hours prior to construction of location and access roads.	E-mail or Phone
Location Completion	AFM	Prior to moving on the drilling rig.	E-mail or Phone
Spud Notice	PET and PE	Forty-Eight (48) hours prior to spudding the well.	E-mail <u>and</u> phone call to PET on cell
Report of actual spud date and time	AFM	Within three (3) business days of actual spud	E-mail or Phone
BOP & Related Equipment Tests	PET and PE	Twenty-Four (24) hours prior to initiating pressure tests.	E-mail or Phone
Casing String and Cementing	PET and PE	Twenty-Four (24) hours prior to running and cementing all casing strings.	E-mail or Phone
Changes to Drilling Plan	PE and PET	Changes to the approved APD's Drilling Plan require <u>prior</u> BLM notification and approval.	Phone
Well Completion Activities	AFM and PET	Before conduction well completion activities (fracturing, acidification, etc.)	Phone
Drilling Problems/Issues	PET and PE	Report waterflows, lost circulation, kicks, well control events, etc.	Phone

DRILLING REQUIREMENTS:

Dan A. Hughes procedure to drill the San Francisco Creek #1 well is approved with the following conditions. BLM's drilling requirements can be found in Onshore Order No. 2 Drilling Operations.

1. A copy of the approved APD and the attached Conditions of Approval shall be available on location at all times once drilling operations have started.
2. In providing advance notification of the Spud Notice, please call the BLM Petroleum Engineer and Petroleum Engineering Technician at least 48 hours prior to the spudding of this well.
3. All components of the BOP system shall meet or exceed the pressure rating for a 2M system as determined by the anticipated bottom-hole pressures (Dan A. Hughes plans to use a 5M system), and meet the testing requirements found in Onshore Order #2.
4. A Pason Pit Volume Totalizer (or similar equipment) shall be used to record changes in system mud volumes that may indicate fluid kick or lost circulation situations. Paul Morgan, the Petroleum Engineering Technician, shall be notified immediately at (719) 269-8533 or (719) 429-3188 when a change in mud volume of +/- 10 barrels occurs during drilling operations, unless another volume is agreed upon with BLM as conditions warrant.
5. Onshore Order No. 2 requires all formations containing usable quality water (less than 10,000 ppm) be protected with cement to prevent the contamination or loss of this resource. Regional geologic studies indicate the Conejos Formation aquifer is a 5000'+ thick, highly heterogeneous reservoir where groundwater can have considerable movement both vertically and horizontally. In places, the groundwater is very low in TDS and can be used as high-quality drinking water. The Conejos also supplies water to over 1000 water wells supporting agricultural operations in the San Luis Valley. During drilling operations, casing string(s) that are run through the Conejos shall be cemented from the bottom to the top, and overlap the next highest casing shoe in the hole by a minimum of 200' (if applicable).

6. For each section of hole that is drilled in and through the Conejos Formation, the operator shall run open hole logs (including induction, gamma ray, caliper, SP, and density/porosity logs) before running and cementing casing, which will aid in better understanding the stratigraphy, water quality and flow mechanics associated with the Conejos Formation.
7. The surface casing setting depth shall be increased from 1100' to at least 1400' due to the complex, connected nature of deep groundwater flows within the Conejos Formation, and the presence of deep water wells drilled to a 1400' depth that are located in the vicinity. Casing shall be cemented to the surface.
8. A cement bond log (CBL) shall be run on each string of casing that is set and cemented (with the exception of the surface casing, as long as cement returns are seen and remain at the surface). The information from the CBL will aid in determining the top of cement and degree of bond behind pipe, and whether additional cementing work needs to be done before drilling proceeds. A field copy of each CBL that is run in the wellbore shall be sent to the BLM San Luis Valley Field Office and the Petroleum Engineer (Marvin Hendricks, Royal Gorge Field Office, 3028 East Main St., Canon City, CO 81212).
9. After setting and cementing the surface casing, a mud weight equivalency/formation integrity pressure test of 10 ppg MW shall be performed on the surface casing shoe (and intermediate casing shoe, should this also be run), prior to drilling more than 20 feet of new hole.
10. Intermediate casing shall be required to be run in the hole, should: (a) the formation integrity pressure test of the surface casing shoe fail; or (b) drilling operations encounter severe water inflows that cannot be properly managed or controlled; or (c) drilling conditions are such that the operator is unable to drill ahead. At the time surface drilling operations have been initiated, the operator shall procure a string of intermediate casing as a precaution, and have this available on standby should the need arise.
11. Given the possible presence of geothermal water wells and warm water wells in this area, the drilling rig shall be equipped with H₂S detection and monitoring equipment that activates visible and audible alarms when concentrations of 10 and 15 ppm, respectively, are exceeded.

12. Should H₂S concentrations in excess of 100 ppm be encountered while drilling, the requirements from Onshore Order No. 6 Hydrogen Sulfide Operations shall apply. All required notifications, including any requests for approval that pertain to hydrogen sulfide issues shall be made to: Marvin Hendricks at (719) 429-1307 (cell); or (719) 269-8566 (office).
13. As well as having a sufficient quantity of mud on location for normal drilling operations, the operator shall have an additional 500 bbls of mud pre-mixed and stored in tanks on location, and an additional 500 bbls of water in tanks that could be mixed with dry mud materials that are readily available on location should the need arise.
14. The operator shall also have sufficient tankage on location to handle an extended water kick, or have the ability to construct an emergency pit on the location to store the excess volume of water.
15. Any deviation from the permitted APD's proposed drilling program shall have prior approval from the BLM Petroleum Engineer. Changes may be requested verbally (to be followed by a written sundry sent to this office), or submitted by written sundry if time warrants.
16. Should this well not have commercial production capability, a request for plugging instructions to plug and abandon this well may be obtained from the BLM Petroleum Engineer.
17. Drilling operations authorized by this permit shall not be suspended for more than 30 days once started, without prior approval of the Authorized Officer (AO).
18. Well completion operations will need to be specified in advance and approved by the BLM San Luis Valley Field Office, prior to completing the well.
19. During drilling operations, daily drilling reports (and mud reports) shall be emailed each day to the BLM Petroleum Engineer and Petroleum Engineering Technician. Within 30 days of finishing drilling operations, a chronological daily operations history shall be submitted to the BLM San Luis Valley Field Office for their records.
20. One digital copy of all logs (in PDF or TIFF format), and one hard copy of core descriptions, core analyses, drill stem tests, well-test data, geologic summaries, sample descriptions, and all other surveys or data obtained and compiled during the

drilling operation shall be sent to the BLM San Luis Valley Field Office, 46525 Hwy. 114, Saguache, CO 81149.

21. All fracturing fluids must be mixed, discharged, and recaptured in steel tanks or other suitable containers. **Discharge into pits is not allowed.**
22. The Material Safety Data Sheets (MSDS) as required by the Occupational Safety and Health Administration (29 CFR 1910.1200 and 29 CFR 1926.59) must be at the drilling site, and available for BLM inspection.

SURFACE USE REQUIREMENTS:

All operations will be conducted as approved in the APD and according to the BLM Gold Book as applicable. In addition the following conditions apply:

1. Air Quality:
 - a) The operator will use industry best practices, including watering, graveling, and reseeded to reduce fugitive dust emissions from vehicular traffic and disturbed surfaces. Interim reclamation practices should be implemented in order to stabilize the site and prevent fugitive dust from being generated. It is anticipated that the operator would apply for either an APCD air permit for the site as a whole, or cover individual equipment under one of Colorado's general permits for oil and gas operations. The state of Colorado, as the regulatory authority for oil and gas actions, requires controls of emissions and standards for compliance that the operator will be subject to. The operator will comply with State of Colorado requirements and make every effort to minimize emissions through good engineering and operating practices to the maximum extent practical.
 - b) Process equipment will be permitted by CDPHE in accordance with applicable requirements and required emissions standards to limit the facility's potential to emit and provide appropriate operating, monitoring, and recordkeeping requirements.
 - c) All FRAC Pump engines will be required to meet EPA Non-Road Tier III Emissions Standards.
 - d) Drill rigs should meet EPA Non-Road Tier II Emissions Standards for all drilling operations.

2. Spills:

a) Any discharge of materials listed in the Environmental Protection Agency (EPA) regulations in 40 CFR PART 302, table 302.4, or produced hydrocarbons, which contacts soil or water (including pits) must be immediately reported to the BLM SLVFO. All spill reporting needs to follow the reporting requirements outlined in NTL-3A. Appropriate spill response kits need to be onsite and in vehicles.

3. Paleontology:

a) The Operator will notify the BLM SLVFO immediately if any vertebrate fossils or heir traces are discovered during operations. Operations may continue as long as the fossil specimen would not be damaged or destroyed by the activity. Within 5 working days of notification, the BLM SLVFO shall evaluate or have evaluated such discoveries and shall notify the operator what action shall be taken with respect to such discoveries.

b) The surface estate is not owned by the Federal Government; however, the mineral estate is administered by the BLM. Paleontological resources are considered to be part of the surface estate. The surface owner may elect to waive paleontological mitigation recommendations.

4. Historic and Cultural Resources:

a) Any cultural and/or paleontological resources (historic or prehistoric site or object) discovered by the BLM or any person working on the BLM's behalf, on public or Federal land shall be immediately reported to the Authorized Officer, Field Manager-BLM, Saguache, Colorado. The BLM or its contractors shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the Authorized Officer. An evaluation of the discovery will be made by the Authorized Officer to determine the appropriate actions to follow to prevent the loss of significant cultural or scientific values. The BLM will be responsible for the cost of the evaluation. Any decision as to proper mitigation measures to be taken will be made by the Authorized Officer after consultation with the Colorado State Historical Preservation Office.

5. Wildlife Resources:

- a) For the protection of big game winter range, no surface use is allowed (excluding operation and maintenance of production facilities) from December 15 to March 31 (Lease Stipulation).
- b) To be in compliance with the Migratory Bird Treaty Act (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186, BLM must avoid actions, where possible, that result in a “take” of migratory birds. No habitat disturbance (removal of vegetation such as timber, brush, or grass) is allowed during the periods of May 15 - July 15, during the breeding and brood rearing season for most Colorado migratory birds. If vegetation removal can be planned and accomplished prior to May 15, then other operations (pad construction, drilling operations, and production operations) may proceed.
- c) Construct, modify and maintain all open-vent exhaust stacks to prevent birds and bats from entering, and to discourage perching, roosting and nesting to be in compliance with the Migratory Bird Treaty ACT (MBTA) and the Memorandum of Understanding between BLM and USFWS required by Executive Order 13186.
- d) A visual survey for raptor nests will be conducted in surrounding trees and uplands within a quarter mile of the project site. If a nest is found, a no surface use timing limitation from February 1 through August 15 will be implemented.
- e) If prairie dogs are present within the project area, the operator should incorporate special modifications to facility siting, design, construction, and operation to minimize involvement of prairie dog burrow systems (Colorado State Stipulation for Prairie dog).
- f) Abide by special daily and seasonal activity restrictions on construction, drilling, product transport, and service activities during Gunnison prairie dog reproductive period (March 1 – June 15; Colorado State stipulation for prairie dog).

- g) Provide in-kind compensation for habitat loss and/or displacement of Gunnison prairie dog (e.g., special on-site PD habitat enhancement) when appropriate (Colorado State Stipulation for Prairie dog).
- h) Conduct winter eagle roost survey. No surface use is allowed within 0.5 miles of an active winter roost site between November 15 and March 15 (Colorado State Stipulation for Bald eagle).
- i) All open pits will be fenced with a wildlife exclusion design on three sides during drilling phase (open side towards the drill rig), and completely fenced once drilling has ceased. It is the responsibility of the operator to ensure the functional condition of the fence while liquid material is present.
- j) All open pits will be netted to prevent access by migratory birds until produced water is absent. It is the responsibility of the operator to ensure the net remains in a functional condition while liquid material is present.
- k) The operator will design, construct, and maintain enclosure fencing for all open cellars and fluids pits containing freestanding fluids to prevent access to livestock and large forms of wildlife such as deer, elk, and pronghorn. At a minimum, the operator will adequately fence all fluids pits and open cellars during and after drilling operations until the pit is free of fluids and the operator initiates backfilling. The operator will maintain the fence in order to protect public health and safety, wildlife, and livestock.

6. Reclamation:

- a) When clearing pad area, the brush and tree limb materials shall be buried or used for mulch. During road and pad construction, top soil should be stripped and stockpiled separately from surface soils to a depth of 6-12 inches (as available).
- b) All interim and final reclamation must be approved by this office prior to completing work. Cut banks will be reduced to no more than 30% rise slopes wherever possible. Locations not hardened for facilities and driveway will be seeded. If the well is a producing well, then the top soils stock

pile should be spread over the cut and fill slope and the portions of pad not necessary for driving surface. After seeding, the brush and limb materials shall be scattered over the reclaimed area. Use of a chipper on brush and limb materials prior to spreading is acceptable.

The same procedures apply to reclamation of the access road area. If the well is plugged after drilling, then the top soil and brush/limb materials should be used over the entire reclaimed pad and road area. If this is not the desired reclamation procedure of the surface owner, submit SN of proposed reclamation change in SN, stating surface owner desire reclamation procedure prior to commencing reclamation operations.

- c) The proposed seed mixture must be provided and approved by BLM prior to seeding of location. All seed must be certified weed free. After seeding is completed, operator must furnish copies of seed labels on all seed used for reclamation on this well pad and the access road.
- d) Equipment used to implement the proposed action should be washed prior to entering the project area to remove any plant materials, soil, or grease. Areas disturbed by project implementation will be monitored for the presence of weeds on the Colorado State Noxious Weed list. Identified noxious weeds will be treated. Monitoring is required for the life of the project and for three years following completion and/or abandonment of the wells and elimination of identified Colorado State Noxious Weeds list A and B species.

7. Visual Resources:

- a) Color Selection - Color selection typically has the greatest impact on the visual success or failure of projects. Strong contrasts in color, such as unpainted drilling infrastructure, create easily recognizable visual conflicts in the landscape and require mitigation. Color selection should be made in accordance with the BMP criteria and utilizing BLM's Environmental Color Selection Chart. Recommended color for painting infrastructure in the Dan A. Hughes San Francisco Creek APD #1 project is "**Covert Green.**"
- b) Earthwork - The scars left by excessive cut and fill activities during construction often leave long-lasting negative visual impacts. This is especially true of activities that disturb the highly mineralized soils of the arid west. There are a number of ways to reduce the contrasts created by earthwork construction, including proper siting or location and linear alignment. Fitting fluid mineral developments to the existing landforms in a manner that minimizes the size of cuts and fills, and in accordance with the criteria defined in the BMP, will greatly reduce visual impacts from earthwork.

- c) Vegetative Manipulation - Plan, design, and locate vegetative manipulation in a scale which retains the color and texture of the characteristic landscape, borrowing directional emphasis of form and line from natural features.
- d) Structures – Structures should be designed to repeat the form, line, color and texture of the surrounding landscape. Locate structural improvements to meet Scenic Quality Objectives (i.e. utilize natural features to screen from view structures such as drill rigs, access roads, pipelines, etc.).
- e) Reclamation/Restoration – An important aspect of any surface-disturbing activity is to reclaim and restore the landscape to the greatest extent possible after project completion. The objectives of restoration and reclamation include 1) reducing long-term visual impacts by decreasing the amount of disturbed area and 2) blending the disturbed area into the natural environment while still providing for project operations.
- f) Linear Alignment Design Considerations - Proper siting and location of developments can often contribute significantly to the reduction of line and color impacts, making other measures either unnecessary, less costly and easier to accomplish. Considerations for fluid mineral developments include:
 - g) Place fluid mineral structures (such as drill rigs, access roads, pipelines, etc.) within the surrounding vegetation or in locations that minimize visibility, when such a location is feasible.
 - h) Minimize the amount of disturbance within view of travel ways (including roads, trails, and recreation areas).