HYDROGEOLOGIC RESOURCES REPORT FOR THE TERERRO PROJECT IN SANTA FE COUNTY, NEW MEXICO

SEPTEMBER 2020

PREPARED FOR

Comexico, LLC / New World ResourcesResources Limited

PREPARED BY

SWCA Environmental Consultants

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EXECUTIVE SUMMARY

The purpose of this report is to present basic hydrogeologic information for a potential Comexico, LLC (Comexico), exploration project in northern New Mexico. Comexico has identified an exploratory drill site (the "project site") for initial investigation purposes. This report is intended to fulfill the hydrology requirements under National Environmental Policy Act (NEPA) permitting and/or permitting by other state or local agencies. The report discusses general hydrologic data information available to the public, and site-specific information that may be relevant to the project site's hydrologic characterization. The report addresses the potential effects the proposed project may have on regional hydrologic resources, and mitigation measures to reduce impacts.

The project site lies within the Upper Pecos watershed, in the Santa Fe range of the Sangre de Cristo Mountains. The nearest perennial waters are Indian Creek (about 1 mile away) and the Pecos River (about 2.5 miles away). Three springs were identified by field personnel within or near the project area. Hydrogeologic and water quality data exist and are sufficient to generally characterize the site, though many data sources are dated and incomplete. Water quality of nearby perennial streams is of high quality, based on available water quality samples; no impaired waters exist near the project site, though some do exist downstream in the Pecos watershed.

The geology of the site is that of the Pecos Greenstone Belt (Robertson and Moench 1979) and the historic Jones Mine.

> The Pecos greenstone belt is host to the Pecos mine . . . which is developed on an important stratabound volcanogenic massive-sulfide deposit that yielded 2.3 million tons of ore containing copper, lead, zinc, gold, and silver. The Jones mine, about 4 mi southwest of the Pecos mine, is developed on a similar type of deposit; an important massive-sulfide deposit was discovered by Conoco near the Jones mine (Mining World 1978). These deposits are closely related to metamorphosed vent-facies rhyolite that define, along with other associated metavolcanic and metasedimentary rocks, the Pecos volcanic center (Riesmeyer 1978; Riesmeyer and Robertson 1979). (Moench and Lane 1988)

Groundwater does occur at the project site. An existing well is located close by and is reported to produce 27 gallons per minute from a limited fracture zone, and several adits exist that have been reported to contain water.

Impacts to these sensitive perennial surface waters would not occur from drilling operations based on the distance, drilling techniques, and expectations for hydrogeology at the site. Potential future drilling is primarily a concern for the potential for removal of vegetation, surface disturbance, unprotected disturbed soil, excessive erosion, and sedimentation to downstream waters during runoff events. While soils in the project area have moderate to severe susceptibility to erosion, all of these issues are fully preventable provided that best management practices are followed and sediment controls are employed, and no impacts to surface waters would occur.

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CHAPTER 1. INTRODUCTION

The purpose of this report is to present basic hydrogeologic information for a potential Comexico, LLC (Comexico), exploration project in northern New Mexico. The project is located in Santa Fe County, New Mexico, adjacent to the county line between Santa Fe and San Miguel Counties (Section 1, Township 17N, Range 11E). Comexico has identified an exploratory drill site (the "project site") for initial investigation purposes (Figure 1), which is the subject of this report. The project site is situated in the Pecos Greenstone Belt of the Sangre de Cristo Mountains and lies within the Upper Pecos watershed.

This report is intended to fulfill the hydrology requirements under National Environmental Policy Act (NEPA) permitting and/or permitting by other state or local agencies. The report discusses general hydrologic data information available to the public, and site-specific information that may be relevant to the project site's hydrologic characterization. The report addresses the potential effects the proposed project may have on regional hydrologic resources, and mitigation measures to reduce impacts.

CHAPTER 2. PHYSIOGRAPHIC SETTINGS

2.1 GENERAL SETTING

The project is located in a mountainous region of New Mexico, in what is known as the Santa Fe Range of the Sangre de Cristo Mountains. The Pecos River watershed western divide lies west of the project site and follows the ridgeline of the Sangre de Cristo to the Glorieta Mesa. Headwaters of the Pecos River begin in the Sangre de Cristo Mountains and flow southeast and south along steep gradients before exiting the mountains and flowing through wider and flatter basins (Summers 1972).

The project site is located between two tributaries of the Upper Pecos River Watershed (HUC 13060002): Indian Creek – Pecos River (HUC 130600010204), and Dry Gulch – Pecos River (HUC 130600010205) (Upper Pecos Watershed Association [UPWA] 2012). Approximately 2.5 miles east of the project site the mainstem of the Pecos River flows south and east for approximately 275 miles, exiting New Mexico and flowing to its confluence with the Rio Grande River in Texas.

The Sangre de Cristo Mountains form the hydrogeologic divide between several groundwater basins (in this context, "groundwater basin" refers both to a physical hydrogeologic feature and an administrative designation by the New Mexico Office of the State Engineer). To the east of the Sangre de Cristo Mountains lies the Canadian River groundwater basin; the portion of this basin closest to the Sangre de Cristo Mountains is known as the Las Vegas Plateau physiographic region. The Las Vegas Plateau is characterized by a deep sequence of sedimentary rocks and associated aquifers. To the west of the Sangre de Cristo Mountains lies the Rio Grande groundwater basin, characterized by aquifers situated in deep basin fill deposits.

2.2 CLIMATE

Temperatures in the Sangre de Cristo Mountains range from below zero degrees Fahrenheit (°F) in the winter months to over 100°F in summer months. Precipitation averages 40 inches a year with about one-third of the precipitation falling during summer monsoons, which usually occur as thunderstorms and have the potential to cause short-term flash flooding. Winter frontal storms contribute to most of the precipitation in the region in the form of snowfall. Generally, nearly half of the streamflow in the mainstem of the Pecos River results from spring runoff (April through June); only a small portion (<10 percent) of streamflow is thought to come from summer monsoons (Matherne and Stewart 2011; UPWA 2012). Precipitation and average climate data recorded at area climate stations are described in Table 1.

Table 1. Average Annual Climate at the Project Site

Station	Period of Record	Average Annual Precipitation (inches)	Average Annual Snowfall (inches)	Average Annual High/Low Temperature (°F)
Windsor	1897–1950	24.12	N/A	58.5/24.0
Cowles	1894–1964	23.27	79.2	58.3/25.5
Irvins RCH	1935–1945	29.83	N/A	N/A
Terrero	1946–1961	17.57	42.6	61.0/25.4
Holy Ghost Canyon	1946–1956	22.02	74.4	N/A

Source: Western Regional Climate Center (2019)

N/A = Data not available for this station

2.3 GENERAL WATERSHED CONDITIONS

Elevations within the Pecos River Watershed (roughly 2.7 million acres) reach above the timberline at well over 13,000 feet above mean sea level; the project site is located at roughly 8,800 to 9,400 feet above mean sea level. Stream channels in these mountainous regions run straight and fast, flowing into narrow channels through steep narrow valleys (UPWA 2012). The proposed project area is located within three Biotic communities. These are classified as: Petran Montane Conifer Forest, Petran Subalpine Conifer Forest, and Alpine Tundra, above the treeline (Brown et al. 2007). The Indian Creek subwatershed contains a mixture of conifer with stands of ponderosa pines found on south-facing slopes, while vegetation in the Dry Gulch subwatershed consists of ponderosa pine, aspen, and mixed conifer (UPWA 2012). During the biological survey, biologists identified these general vegetation community types within the proposed project area. At the time of the biological survey, the vegetation community within and/or surrounding the proposed project area had previous disturbance from mining, logging, and livestock grazing activities, as well as from recreational use such as hunting, off-road vehicles, and camping.

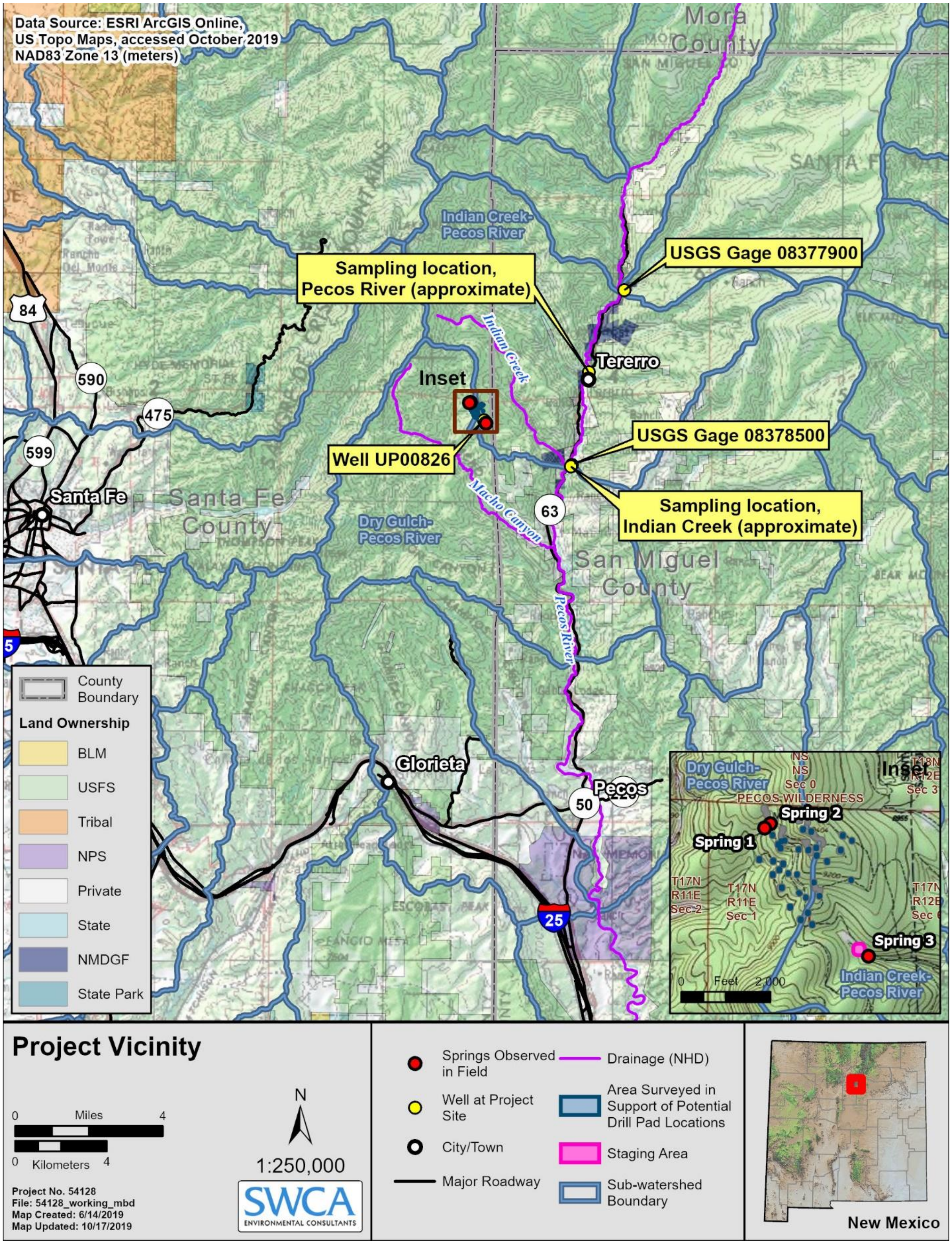

Figure 1. General location of the project site.

CHAPTER 3. HYDROGEOLOGY

3.1 LITERATURE REVIEW

In addition to obtaining data from available public databases, a number of geologic and hydrogeologic reports were reviewed for the project:

- Baltz, E.H., Jr., and G.O. Bachman. 1956. Notes on the geology of the southeastern Sangre de Cristo Mountains, New Mexico. In *New Mexico Geological Society 7th Annual Fall Field Conference Guidebook*, pp. 96–108. Accessed July 22, 2019, at: http://nmgs.nmt.edu/publications/guidebooks/7
- Clark, K.F., 1966. Geology of the Sangre de Cristo Mountains and adjacent areas, between Taos and Raton, New Mexico. In *New Mexico Geological Society 17th Annual Fall Field Conference Guidebook*, pp. 56–65. Accessed July 22, 2019, at: http://nmgs.nmt.edu/publications/guidebooks/17
- Fulp, M.S., and J.L. Renshaw. 1985. Volcanogenic-exhalative tungsten mineralization of Proterozoic age near Santa Fe, New Mexico, and implications for exploration. *Geology* 13:66–69.
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- Lucas, S.G., K. Krainer, W.A. Dimichele, S. Voigt, D.S. Berman, A.C. Henrici, L.H. Tanner, D.S. Chaney, S.D. Elrick, W.J. Nelson, and L.F. Rinehart. 2015. Lithostratigraphy, biostratigraphy and sedimentology of the Upper Paleozoic Sangre De Cristo Formation, southwestern San Miguel County, New Mexico. In *New Mexico Geological Society 66th Annual Fall Field Conference Guidebook*, pp. 211–228. Accessed July 22, 2019, at: http://nmgs.nmt.edu/publications/guidebooks/66
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- Mattingly, B.E. 1990. *A Hydrogeologic Evaluation of the Upper Pecos Ground Water Basin in the Vicinity of the Glorieta Baptist Conference Center, Glorieta, New Mexico*. New Mexico State Engineer Office, Technical Division Hydrology Report 90-1. February.
- Miller, J.P., A. Montgomery, and P.K. Sutherland. 1963. *Geology of Part of the Southern Sangre de Cristo Mountains, New Mexico*. New Mexico State Bureau of Mines and Minerals, Memoir 11.
- Moench, R.H., J.A. Grambling, and J.M. Robertson. 1988. *Geologic Map of the Pecos Wilderness, Santa Fe, San Miguel, Mora, Rio Arriba, and Taos Counties, New Mexico.* U.S. Geological Survey Miscellaneous Map Series MF-1921-B.
- Moench, R. H. and M.E. Lane. 1988. *Pamphlet to Accompany Miscellaneous Map Series MF-1921-A, Mineral Resource Potential of the Pecos Wilderness, Santa Fe, San Miguel, Nora, Rio Arriba, and Tags Counties, New Mexico*. U.S. Geological Survey.

- Robertson, J.M., M.S. Fulp, and M.D. Daggett III. 1986. *Metallogenic Map of Volcanogenic Massive-Sulfide Occurrences [sic] in New Mexico*. U.S. Geological Survey Miscellaneous Field Studies Map MF-1853-A, Volcanogenic Massive-Sulfide Map Series.
- Robertson, J.M. and R.H. Moench. 1979. The Pecos greenstone belt—A Proterozoic volcano-sedimentary sequence in the southern Sangre de Cristo Mountains, New Mexico. In *New Mexico Geological Society 30th Annual Fall Field Conference Guidebook*.
- Slack, J.F., T. Grenne, and A. Bekker. 2009. *Seafloor-hydrothermal Si-Fe-Mn Exhalates in the Pecos Greenstone Belt, New Mexico, and the Redox State of ca. 1720 Ma Deep Seawater*. *Geosphere* 5:302−314.
- Summers, W.K. 1972. *Geology and Regional Hydrology of the Pecos River Basin, New Mexico*. New Mexico Institute of Mining and Technology.
- U.S. Geological Survey, U.S. Bureau of Mines, and New Mexico Bureau of Mines and Mineral Resources. 1980. *Mineral Resources of the Pecos Wilderness and Adjacent Areas, Santa Fe, San Miguel, Mora, Rio Arriba, and Taos Counties, New Mexico*. U.S. Geological Survey Open-File Report 80-382.

3.2 HYDROGEOLOGY OF THE PROJECT AREA

Most of the Pecos River Basin as a whole lies within the Pecos Valley Section of the Great Plains geophysical Province. The Pecos Valley Section is an elongated trough between the High Plains Province lying to the east and the Basin and Range Province toward the west (Summers 1972). However, while the project site lies within the Upper Pecos surface watershed, it does not share the general geology of the watershed, and instead geologically lies within the Pecos Greenstone Belt of the very southern edge of the Southern Rocky Mountains Province. The geology within the Sangre de Cristo Mountains in the vicinity of the project site has been reasonably well-described in literature. The hydrogeology of the southern Sangre de Cristo Mountains is more complicated than that of the basins to the east or west, or the rest of the Upper Pecos watershed located downstream.

The generalized geology in the vicinity of the site is that defined by Robertson and Moench's Pecos Greenstone Belt:

> Proterozoic igneous and metamorphic rocks are exposed in several approximately north-trending belts in the Sangre de Cristo Mountains of north-central New Mexico and south-central Colorado. In New Mexico, with the exception of the Picuris Range, these rocks received little detailed geologic attention prior to the mid-1970's. Recent mapping has delineated an extensive volcano-sedimentary terrane (hereafter in-formally called the Pecos greenstone belt) that seems analogous to Archean greenstone belts in the Canadian Shield. The Pecos greenstone belt occupies an area of some 650 km^2, mainly in the headwaters area of the Pecos River northeast of Santa Fe. It is defined by a closely interrelated assemblage of metamorphosed subaqueous basalts and locally important felsic metavolcanic rocks, iron-formation, and metasedimentary rocks, some of volcanic provenance. The Pecos greenstone terrane is faulted on the west, and is intruded by voluminous plutonic and apparently subvolcanic rock. Although rocks of the greenstone terrane are at least twice folded, variably metamorphosed in the greenschist and amphibolite facies, and intruded by the abundant igneous rocks, fine details of primary sedimentary and volcanic features are preserved locally. (Robertson and Moench 1979)

The immediate project area consists of a north-south elongate wedge of surface-exposed greenstone terrane that is bounded on the west by a granitic intrusion and on the east by Permian- and Pennsylvanian-age sedimentary units, which are interpreted to overlie the greenstone terrane.

Estimated thickness of these units in the southern part of the Sangre de Cristo Mountains is provided in Table 2.

Table 2. Generalized Stratigraphy in the Vicinity of the Project Site

Geologic Period	Geologic Unit	Generalized Description	Estimated Thickness in Southern Sangre de Cristo Mountains (feet)
Permian	Sangre de Cristo	Arkose sandstone interbedded with red shales and siltstones.	-
Pennsylvanian	Alamitas	Part of a cyclic marine limestone unit more commonly known as the Madera Formation. The upper portion can be known as the Alamitas Formation, and is an arkosic limestone.	~1,200
Pennsylvanian	La Pasada	Also part of the Madera Formation. The lower portion can be known as the La Pasada Formation, and is a fossiliferous, gray limestone.	~1,000
Mississippian	Terrero Formation	A sparsely fossiliferous limestone sequence	~90
Mississippian	Espiritu Santo	Fossiliferous unit composed primarily of limestone and dolomite, with some clastic layers	~60
Mississippian	Del Padre	Unfossiliferous, orthoquartzitic sandstone and conglomerate	~750
Precambrian	Pecos Greenstone Terrane	Metavolcanic, metasedimentary, and intrusive rocks	??

Thickness sourced primarily from Miller et al. (1963).

One groundwater well has been drilled near the project site within the greenstone terrane, associated with water right UP00826. The geologic log (see Appendix A) from the UP00826 well indicates the following geology:

- 0–22 feet, overburden
- 22–240 feet, mixed quartz-biotite-chlorite rock, black biotite-chlorite, schist and green chlorite-quartz-sericite schist

These descriptions are consistent with those of the Pecos Greenstone Belt.

In the vicinity of the site, groundwater likely occurs primarily within localized fractures, with some possible regional connectivity provided by the overlying sedimentary units present to the east. General descriptions in literature suggest that the primary water-bearing unit in the mountainous regions of the Upper Pecos Valley is the Precambrian metamorphic and igneous rocks, where faults and fractures occur at shallow depths; reportedly several gallons per minute can also be obtained from units of the Sangre de Cristo and Alamitas formations (Griggs and Hendrickson 1951; Matherne and Stewart 2012). In either case, aquifer pumping capacities are relatively limited, compared with the basins to the west or east.

3.3 PUBLIC DATABASES REVIEWED

The following publicly available databases were reviewed for pertinent hydrogeologic and surface water information for the project site:

- U.S. Geological Survey (USGS) National Water Inventory System (NWIS). The USGS NWIS contains information on well locations, groundwater levels, surface water flow data, and water quality data.
- U.S. Environmental Protection Agency (EPA) STORET database. The EPA STORET database is a comprehensive water quality database that is used by multiple federal and state agencies to consolidate and store water quality data collected by agencies.
- New Mexico Water Rights Reporting System (NMWRRS). The NMWRRS contains records of filed water rights in the state (wells and surface water diversions), as well as information on pumping rate, productive intervals for wells, and groundwater levels.
- New Mexico Oil Conservation Division. The New Mexico Oil Conservation Division maintains well logs and records for oil and gas wells, including detailed stratigraphy and water-bearing units. The closest well located was approximately 8 miles southeast of the project site.
- U.S. Fish and Wildlife Service National Wetlands Inventory (NWI). The NWI contains information on wetland areas. Many of the areas identified in the NWI are not true wetlands (such as ephemeral drainages), but still represent areas that may have hydrologic importance.
- U.S. Environmental Protection Agency Safe Drinking Water Information System. This database contains details on public water systems, including their sources of water supply and population served.

3.3.1 Typical Depths to Water and Pump Rates

NMWRRS locations were mapped according to reported coordinates in the Upper Pecos watershed. The New Mexico Office of the State Engineer has a record of 290 wells within 10 miles of the project site (see Appendix B). Table 3 describes the 20 nearest Point of Division (POD) permit numbers, and their well type, estimated groundwater yield, depth to water, well depth, and if known, the formation from which water is obtained. The recorded median well depth is roughly 120 feet, with a median water depth of 25 feet, and a median estimated yield of 11 gallons per minute (gpm) (NMWRRS 2019). The well drilled at the project site (UP00826) is present in the data set.

Table 3. Selected Wells with Depth to Water and Estimated Yield

POD No.	Well Type*	Location	Water source	Estimated Yield (gpm)	Depth to Water (feet)	Depth of Well (feet)	Distance from project (feet)
UP 00826	72-12-1. Prospecting or Development of Natural Resource	At project site	Unknown formation	27	17.48†	240	1,700
UP 04171 POD1	Exploration	Along mainstem of Pecos River, near Tres Lagunas	Unknown formation	2	30	400	14,800
UP 03704	72-12-1. Domestic One Household	In side canyon, near mainstem of Pecos River, south of Indian Creek	Unknown formation	6	12	100	14,800

POD No.	Well Type*	Location	Water source	Estimated Yield (gpm)	Depth to Water (feet)	Depth of Well (feet)	Distance from project (feet)
UP 02394	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Terrero	Unknown formation	10	38	120	14,900
UP 03803	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Terrero	Unknown formation	5	32	150	15,000
UP 01282	Commercial	Along mainstem of Pecos River, near Tres Lagunas	Unknown formation	30	21	120	15,200
UP 01667	72-12-1. Domestic One Household	West of Pecos River, south of Indian Creek	Sandstone/ Gravel/ Conglomerate	15	28	101	15,600
UP 01668	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Terrero	Sandstone/ Gravel/ Conglomerate	12	28	102	15,700
UP 02863	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Tres Lagunas	Unknown formation	3	45	340	15,800
UP 03829	72-12-1. Domestic One Household	East of Pecos River, north of Indian Creek confluence	Sandstone/ Gravel/ Conglomerate	5	52	198	16,100
UP 02590	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Indian Creek	Unknown formation	30	10	85	16,300
UP 01717	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Indian Creek	Unknown formation	Unknown	Unknown	Unknown	16,300
UP 04756 POD2	Monitoring well	Along mainstem of Pecos River, near Terrero	Unknown formation	Unknown	Unknown	Unknown	16,400
UP 03535	72-12-1. Domestic One Household	Along mainstem of Pecos River, near Terrero	Unknown formation	Unknown	Unknown	Unknown	16,600
UP 04756 POD1	Monitoring well	Along mainstem of Pecos River, near Terrero	Unknown formation	Unknown	Unknown	Unknown	16,800
UP 00957	72-12-1. Prospecting or Development of Natural Resource	West of Pecos River, between Macho and Dalton Canyons	Sandstone/ Gravel/ Conglomerate	Unknown	Unknown	75	17,000
UP 01688	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Indian Creek	Shallow Alluvium/Basin Fill; and other unknown formations	90	6	101	17,200

POD No.	Well Type*	Location	Water source	Estimated Yield (gpm)	Depth to Water (feet)	Depth of Well (feet)	Distance from project (feet)
UP 02250	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Indian Creek	Unknown formation	10	12	192	17,600
UP 04164	72-12-1. Domestic One Household	Along mainstem of Pecos River, south of Indian Creek	Sandstone/ Gravel/ Conglomerate	12	21	145	17,800
UP 04480	DOM	Along mainstem of Pecos River, south of Indian Creek	Unknown formation	Unknown	Unknown	Unknown	18,000
Median				**11**	**24.5**	**120**	

* Numbers shown reference the New Mexico Statutes, Chapter 72 – Water Law

† Depth of water measured at site on August 1, 2019

The nearest well to the center of the project area is that which Comexico proposes to use in its drilling program, POD UP 00826, which has a current use code of “72-12-1 Prospecting or Development of Natural Resource.” The next nearest well is 14,800 feet away (2.8 miles), just south of the confluence of Indian Creek and the Pecos River. Wells in the region are concentrated along the main drainages, particularly along the Pecos River. It is likely that the placement of these wells has less to do with hydrogeology and more to do with physical accessibility. Most wells appear to be deeper than the shallow alluvial deposits associated with the relatively confined river floodplain, and likely intersect both shallow alluvial material and deeper fractured rock. Overall, the well records appear to show the consistent presence of accessible groundwater, though of limited quantity. Only one of these wells exceeds a pumping rate of 30 gallons per minute, and the median pumping rate is much lower.

The closest and most pertinent data for the project site come from the UP00826 well. As previously described, this well is 240 feet deep and completed almost entirely within the greenstone terrane. The depth to water in this well was originally reported to be 95 feet below ground surface (1981), and the driller’s log indicates that the well was able to produce 27 gallons per minute from a “fracture zone” present between a depth of 205 and 220 feet (see Appendix A). A recent measurement of the depth to water at this well showed the water level to be at 17.48 feet beneath the surface (August 2019).

3.3.2 Groundwater Quality

No specific groundwater quality data were identified in the project area. However, during a 2004 site inspection of the Jones Hill site conducted by the New Mexico Energy, Mineral and Natural Resources Department (EMNRD), water was observed flowing from two adits on-site (EMNRD 2004). The larger stream of water flowing appeared from a small adit below the main adit and dripping was heard. The water from these adits appeared to be clear during the site visit and did not have visible indications of contamination. The U.S. Forest Service was made aware of the collapse of infrastructure and water flowing from the two adits after the survey was completed on August 25, 2004 (EMNRD 2004).

During a site visit on August 8, 2019, Comexico collected Total Dissolved Solids (TDS) measurements from the groundwater seeps at the two historic mine adits. The upper adit recorded a TDS of 220 milligrams per liter (mg/L), and the lower adit recorded a TDS of 240 mg/L.

3.3.3 Springs

Available data sources were searched to identify the possible presence of any springs in the project area. Data sources reviewed include:

- The USGS Geographic Names Inventory System (GNIS), which contains geographic labels that appear on topographic maps, including springs;
- The National Hydrography Dataset (NHD), which includes point locations for springs;
- The Santa Fe National Forest 7.5-minute quadrangle map for the area (Rosilla Peak);
- The USGS NWIS; and
- Field observations from SWCA personnel in July 2019.

The nearest springs to the project area are shown in Table 4. The closest springs to the proposed drilling locations are three springs that were observed in the field; locations of these springs are shown on Figure 1.

Table 4. Springs Identified within 10 Miles of Project Area

Spring Name	Location	Source
Spring #1	Located at the northwest edge of the project area, on the side slope of a tributary drainage to Macho Creek, about 300 feet from the nearest drill pad.	Observed in field
Spring #2	Located at the northwest edge of the project area, within a tributary drainage to Macho Creek, about 300 feet from the nearest drill pad.	Observed in field
Spring #3	Located southeast of the project area, about 200 feet away from the proposed laydown/staging area.	Observed in field
Burnt Spring	9 miles northeast of project area; in headwaters of Willow Creek	USGS GNIS
Alamosa Spring	6.5 miles southeast of project area; near Upper La Posada along Pecos River	USGS GNIS
Unnamed Spring	5 miles east of project area; near Rosilla Peak	NHD
Unnamed Spring	2.3 miles southeast of project area; in a side canyon tributary to Sawyer Creek	NHD
2 Unnamed Springs	5 miles southwest of project area; in La Cueva Canyon	NHD
Ojito Escondido	9 miles southeast of project area	USGS GNIS; NHD

Springs #1 and #2 are located within the project area, within an ephemeral drainage that flows to the south-southwest and is eventually tributary to Macho Creek. These springs are located near an old mine adit; a standing pond of water is also located nearby and was believed by field personnel to be caused by water draining from the mine adit. Spring #1 is located on the side slope of the canyon (see Figure 2). Spring #2 is located near the bottom of the same drainage (see Figure 3). Both springs were described primarily as “seasonally wet” areas. These two springs are each located approximately 300 feet from the nearest drill pad.

Figure 2. View of seasonally wet area around Spring #1, northwest edge of the project area.

Figure 3. View of seasonally wet area around Spring #2, northwest edge of the project area.

Spring #3 is located about about 85 feet away from the proposed laydown or staging area and the on-site well (see Figure 4). This spring was also described as a “seasonally wet” area.

Figure 4. View of seasonally wet area around Spring #3, near staging area.

CHAPTER 4. SURFACE WATER HYDROLOGY

4.1 SURFACE WATER OCCURRENCE

The upper Pecos River and its tributaries flow through mountainous valleys that are steep in the upper reaches of the watershed. Streams in the region are primarily Rosgen classification types A, B, and C. The Rosgen classification is a system for natural rivers in which morphological arrangements of stream characteristics are organized into relatively homogeneous stream types. Rosgen types A and B occur along the high-elevation stream reaches and tend to run fast and straight through steep, narrow valleys with little evidence of streambank soil and sediment. The course of these streams is generally controlled by geology and the shape of the surrounding valley and they are not very sinuous. Lower-lying streams are classified as Rosgen type C channels and have slower flow rates, greater sinuosity, and increased floor sediment. Most of these stream reaches, especially at lower to middle elevations, usually have a 30- to 100-foot band of riparian habitat and may include variously sized wetlands.

Macho Creek is one of several perennial streams within the Dry Gulch subwatershed and lies 1.2 miles southwest of the nearest proposed drill pad site. Macho Creek supports Rio Grande cutthroat trout, a native fish, and is managed by New Mexico Department of Game and Fish (NMDGF) as a core conservation area for the species (NMDGF 2016).

Within the Indian Creek subwatershed there are several perennial streams that include Pecos River, Willow Creek, Holy Ghost Creek, Doctor Creek, and Indian Creek. Indian Creek is located 0.8 mile northeast of the nearest proposed drill pad site and flows into the Pecos River about 2.6 miles downstream from the nearest proposed site feature, the staging area site.

4.1.1 Surface Water Flow Data

Springtime snowmelt runoff dominates the flow regimes; however, secondary rises are more unpredictable and occur during the summer monsoon season. Two USGS gaging stations with reasonable periods of record are located in the project area: Rio Mora (approximately 5 miles upstream from the confluence with Indian Creek), and Pecos River, near Pecos (this gage is actually located on the Pecos River at the confluence of Indian Creek).

The gage at the confluence of the Pecos River and Indian Creek represents the closest and most extensive data set (records exist for this gage from 1919 to present). Flow details for this gage are shown below in Table 5. The highest flows are during spring runoff, with a smaller peak during August, from summer convective precipitation. The river has perennial flow throughout the year.

Table 5. Monthly Average Flow for Pecos River, near Pecos (USGS Gage 08378500), Period of Record 1919 to 2018

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	26	27	44	133	329	232	93	104	73	51	38	30

Note: All flows are in cubic feet per second (cfs).

4.1.2 Presence of Wetlands

The U.S. Fish and Wildlife Service (USFWS) maintains the National Wetlands Inventory, a database of wetland areas (USFWS 2019). This database contains much more than true wetlands, and typically includes all drainages whether ephemeral, intermittent, or perennial. The USFWS NWI does not identify any perennial waters or true wetlands in the vicinity of the project site, with the exception of Indian Creek, Macho Creek, and the Pecos River. All other drainages are identified as intermittent.

The USFWS NWI identifies three “seasonally flooded intermittent riverine streambeds” (NWI classification code R4SBC) located within the immediate project area: 1) an unnamed drainage and tributary to Indian Creek within 15 feet of the proposed laydown area, 2) an unnamed drainage and tributary to Macho Creek located 128 feet to the west from proposed drill site DH05, and 3) an unnamed drainage and tributary to Indian Creek located 535 feet north of proposed drill site DH16. In addition to the three NWI areas, there is a man-made stock pond approximately 92 ft down slope from the proposed laydown area.

The State of New Mexico define wetlands in NMAC 20.6.4.7.W(4) and identify the springs and seasonally flooded intermittent riverine streambeds in unnamed tributaries as wetlands.

The proposed laydown area is located upon an established disturbance associated with a present day cattle grazing, historical exploration and associated dwelling activity, and water well UP00826. The proposed laydown area will be utilized as storage of parts, materials, water, and portable toilets in support of the proposed action. Upslope, downslope, and side edges of the laydown area will be bordered by erosion control BMPs such as silt fence and bio socks, and vehicle entrances in and out of the area will be bermed to control possible waters from flowing onto, through, or out of the area. Any fuel stored onsite for the portable generator planned for use to power the water well pump will be kept in containment with a storage volume exceeding twice the capacity of the generator’s fuel tank and will be stored at least 100 ft from the water well or the identified wetland and stream.

Proposed drill site DH05 is 128 feet east of a seasonally flooded intermittent riverine streambed wetland. A local topographic ridge requires that any water flowing through the proposed drill site must flow a distance of 625 feet prior to meeting the subject wetland area. In conjunction with proposed drill site BMPs, surface water associated with any drill site disturbance will be mitigated.

Proposed drill site DH16 is 535 feet south of a seasonally flooded intermittent riverine streambed wetland. Downhill water flow requires that any water flowing through the proposed drill site must flow a distance of approximately 730 ft prior to meeting the subject wetland area. In conjunction with proposed drill site BMPs, surface water associated with any drill site activity will be mitigated.

Comexico will provide an erosion control plan for MMD approval based on site specific condition of the actual drill pad sites and travel routes chosen for the exploration project at least 60-days prior to commencement of the project. This plan will also provide details on the erosion controls that will be implemented during and after reclamation of the disturbed areas.

4.1.3 Soil Types

The following general soil types occur in the project area (Natural Resources Conservation Service 2019):

Drilling area:

- Derecho family, 15 to 40 percent slopes. This family of soils forms on hills and mountain slopes, weathered from parent materials of sandstone, shale, and limestone, and generally consists of cobbly loams. This soil type has a moderate susceptibility to erosion.
- Kadygulch family, 15 to 40 percent slopes. This family of soils forms on hills and mountain slopes, weathered from parent materials of granite or gneiss, and generally consists of cobbly or gravelly clay loam. This soil type has a moderate susceptibility to erosion.
- Broadmoor family-Rock outcrop complex, 25 to 120 percent slopes, extremely stony. This family of soils forms on hills and mountain slopes, weathered from granite, gneiss, quartz-diorite, or quartz-monzonite. This soil type generally consists of extremely stony sandy loam and has a severe susceptibility to erosion.

Access Road:

- Etown, moderately deep-Derecho families-Rock outcrop association, 15 to 120 percent slopes. This family of soils forms on hills, weathered from sandstone and shale and/or limestone and/or residuum weathered from sandstone and shale and/or limestone. This soil type generally consists of very cobbly or stony clay loam or bedrock.

All proposed surface-disturbing activities are intentionally sited to be located where existing roads, historic roads, or historic drill pads have already disturbed the soil. As discussed in Chapter 7, Comexico has committed to constructing drainage control features and implementing best management practices at all drill pads and overland routes in order to mitigate any soil erosion potential both during project operations and during final reclamation activities. The primary source of erosion appears to be the existing roads, and as discussed in Chapter 7, the road maintenance activities would mitigate potential soil erosion from these areas as well.

4.1.4 Surface Water Quality

4.1.4.1 *General Water Quality in the Watershed*

Many soils in the Upper Pecos watershed are highly erodible, which when combined with steep slopes and decades of anthropogenic uses have all contributed to the degradation of water quality across the watershed (UPWA 2012). Water quality stressors in the Upper Pecos watershed include historic mining, logging, grazing, recreational overuse, and wildfires (La Calandria Associates, Inc. 2007). Mining began to occur in the Upper Pecos watershed in the late 1800s; the Terrero Mine, located just east of the project site, was in operation from 1882 to 1939. In 1985, the New Mexico Environment Department (NMED) began investigating water contamination issues in the areas of the Terrero Mine and a monitoring/ remediation program from the site was implemented.

4.1.4.2 *USGS Monitoring Stations*

Water quality data were collected at the Rio Mora gage location from 1967 to 2011, and from the Near Pecos location from 1963 to 2011; however, very few constituents besides basic field measurements have been analyzed since the late 1970s. Water is generally of good quality, with median total dissolved solids concentrations of 62 milligrams per liter (mg/L) at the Rio Mora gage (Table 6). More recent data, primarily specific conductivity measurements (a proxy for total dissolved solids), suggest that water quality remains good.

Table 6. USGS Rio Mora Station (USGS Gage 08377900) Selected Constituents

Constituent	Median	Maximum	Minimum	Number of Samples	New Mexico Surface Water Standard
Arsenic, dissolved (µg/L)	1	6	0	43	150
Copper, dissolved (µg/L)	2	780	0	36	5
Lead, dissolved (µg/L)	2*	30	0.041	37	1
Selenium, dissolved (µg/L)	1	9	0	59	50
Mercury, dissolved (µg/L)	0.1	3.7	0	30	0.77
Aluminum, dissolved (µg/L)	40	240	3.3	54	5,000
Cadmium, dissolved (µg/L)	1*	30	0	43	0.28
Manganese, dissolved (µg/L)	4.5	10	0	55	1,309
Nickel, dissolved (µg/L)	1	10	0.22	48	29
Zinc, dissolved (µg/L)	6	520	0	40	65
Total dissolved solids (mg/L)	62	127	30	199	Not applicable
Nitrate, as N (mg/L)	0.06	0.36	0	68	10
Calcium, dissolved (mg/L)	16	37	3	201	Not applicable
Magnesium, dissolved (mg/L)	1.7	3.8	0.41	201	Not applicable
Potassium, dissolved (mg/L)	0.5	3.8	0.14	199	Not applicable
Sodium, dissolved (mg/L)	1.4	13	0.34	200	Not applicable
Sulfate (mg/L)	8	19	1	200	Not applicable
pH	7.65	9	6.5	258	6.6–8.8

Source: USGS (2019b)

Notes: In many cases, the number used for the statistics reflects the laboratory detection limit, rather than a detectable concentration.

µg/L = micrograms per liter; mg/L = milligrams per liter.

Standards shown are for the most restrictive standard; where standards vary by hardness, a hardness of 50 mg/L calcium carbonate ($CaCO_3$) was used, based on a median hardness of 48 mg/L $CaCO_3$ (200 samples).

* Values represent a possible exceedance of state surface water quality standards; however, in both cases the samples are mostly below laboratory detection limits.

4.1.4.3 *EPA STORET*

The EPA STORET database (now accessed through the WQX web portal) contains surface water quality information for both Indian Creek and the Pecos River (EPA 2019). Similar to the USGS NWIS results, the period of record is limited. Indian Creek was sampled by the NMED in 2001 and 2010 (Table 7). The Pecos River near the confluence with Indian Creek has been sampled by the NMED between 1981 and 2010 (Table 8).

The results confirm the USGS NWIS samples shown in Table 5. Water quality is generally good, with median total dissolved solids of 190 mg/L for Indian Creek and 120 mg/L for the Pecos River near Indian

Creek (see Table 7). All other constituents for which samples exist are generally below New Mexico surface water standards.

Table 7. EPA STORET Indian Creek Selected Constituents

Constituent	Median	Maximum	Minimum	Number of Samples	New Mexico Surface Water Standard
Arsenic, dissolved (µg/L)	No data	No data	No data	No data	150
Copper, dissolved (µg/L)	No data	No data	No data	No data	5
Lead, dissolved (µg/L)	No data	No data	No data	No data	1
Selenium, dissolved (µg/L)	No data	No data	No data	No data	50
Mercury, dissolved (µg/L)	No data	No data	No data	No data	0.77
Aluminum, total (µg/L)	52	104	36	4	530
Cadmium, dissolved (µg/L)	No data	No data	No data	No data	0.28
Manganese, dissolved (µg/L)	2	5	1	4	1,309
Nickel, dissolved (µg/L)	No data	No data	No data	No data	29
Zinc, dissolved (µg/L)	No data	No data	No data	No data	65
Total dissolved solids (mg/L)	190	234	12	7	Not applicable
Nitrate, as N (mg/L)	No data	No data	No data	No data	10
Calcium, dissolved (mg/L)	48.5	53	36.1	4	Not applicable
Magnesium, dissolved (mg/L)	4.1	4.5	3.2	4	Not applicable
Potassium, dissolved (mg/L)	No data	No data	No data	No data	Not applicable
Sodium, dissolved (mg/L)	No data	No data	No data	No data	Not applicable
Sulfate (mg/L)	No data	No data	No data	No data	Not applicable
pH	8.27	8.42	7.87	8	6.6–8.8

Source: EPA (2019)

Notes: In many cases, the number used for the statistics reflects the laboratory detection limit, rather than a detectable concentration.

µg/L = micrograms per liter; mg/L = milligrams per liter.

Sampling stations for Indian Creek include the NMED stations from 2001 and 2010 (21NMEX_WQX-50Indian000.1, 21NMEX-50INDIAN000.1).

Standards shown are for the most restrictive standard; where standards vary by hardness, a hardness of 50 mg/L $CaCO_3$ was used for consistency with the USGS table.

Table 8. EPA STORET Pecos River Selected Constituents

Constituent	Median	Maximum	Minimum	Number of Samples	New Mexico Surface Water Standard
Arsenic, dissolved (µg/L)	No data	No data	No data	No data	150

Constituent	Median	Maximum	Minimum	Number of Samples	New Mexico Surface Water Standard
Copper, dissolved (µg/L)	No data	No data	No data	No data	5
Lead, dissolved (µg/L)	No data	No data	No data	No data	1
Selenium, dissolved (µg/L)	No data	No data	No data	No data	50
Mercury, dissolved (µg/L)	No data	No data	No data	No data	0.77
Aluminum, total (µg/L)	48	997*	19	11	530
Cadmium, dissolved (µg/L)	No data	No data	No data	No data	0.28
Manganese, dissolved (µg/L)	4	10	3	11	1,309
Nickel, dissolved (µg/L)	No data	No data	No data	No data	29
Zinc, dissolved (µg/L)	No data	No data	No data	No data	65
Total dissolved solids (mg/L)	120	146	88	13	Not applicable
Nitrate, as N (mg/L)	No data	No data	No data	No data	10
Calcium, dissolved (mg/L)	31.0	37	24.4	9	Not applicable
Magnesium, dissolved (mg/L)	3.2	3.9	2.6	9	Not applicable
Potassium, dissolved (mg/L)	No data	No data	No data	No data	Not applicable
Sodium, dissolved (mg/L)	No data	No data	No data	No data	Not applicable
Sulfate (mg/L)	No data	No data	No data	No data	Not applicable
pH	8.16	8.7	7.41	20	6.6–8.8

Source: EPA (2019)

Note: In many cases, the number used for the statistics reflects the laboratory detection limit, rather than a detectable concentration.

µg/L = micrograms per liter; mg/L = milligrams per liter.

Sampling stations for Pecos River (near Indian Creek) include NMED stations from 1982 through 2010 (21NMEX_WQX-50PecosR790.7, 21NMEX_WQX-50PecosR795.2, 21NMEX_WQX-50PecosR797.7).

Standards shown are for the most restrictive standard; where standards vary by hardness, a hardness of 50 mg/L $CaCO_3$ was used for consistency with the USGS table.

* Value represents a possible exceedance of state surface water quality standards

4.1.4.4 *Previous Conoco Sampling*

Based on historical files provided by Comexico (Comexico 2019), it appears that Conoco carried out several relatively complete rounds of surface water quality sampling between 1980 and 1983 on Indian Creek, Macho Creek, and the Pecos River; these appear to be some of the most complete and nearest surface water quality samples available, though dated. These results are included in their entirety as Appendix C, and one round of results (June 1980) is shown in Table 9.

These sample results corroborate the sample results obtained from the USGS NWIS and EPA STORET systems, indicating relatively good water quality with low total dissolved solids.

Table 9. Results of Conoco Water Quality Sampling, June 1980

Constituent	Indian Creek	Pecos River above Confluence with Indian Creek
Arsenic, total (mg/L)	0.03	0.01
Copper, total (mg/L)	<0.01	<0.01
Lead, total (mg/L)	<0.01	<0.01
Selenium, total (mg/L)	<0.01	0.01
Mercury, total (mg/L)	<0.001	<0.001
Aluminum, total (µg/L)	<0.01	<0.01
Cadmium, total (mg/L)	<0.01	0.01
Manganese, total (mg/L)	<0.01	<0.01
Nickel, total (mg/L)	<0.01	0.03
Zinc, total (mg/L)	<0.01	<0.01
Total dissolved solids (mg/L)	159	91
Nitrate, as N (mg/L)	0.01	0.01
Calcium, total (mg/L)	27	13
Magnesium, total (mg/L)	2.4	1.6
Potassium, total (mg/L)	0.8	0.71
Sodium, total (mg/L)	7.6	6.3
Sulfate (mg/L)	7	8

Source: Comexico (2019)

Note: µg/L = micrograms per liter; mg/L = milligrams per liter

4.1.4.5 *Impaired Waters*

The New Mexico 2018 Clean Water Act Section 303(d)/Section 305(b) Integrated Report identifies a number of impaired waters within the Pecos River headwaters watershed; however, all of these areas are well downstream of the project site and the Sangre de Cristo Mountains, and are not pertinent to the project activities (NMED 2018).

Macho Creek, the nearest Clean Water Act Section 303(d) listed impaired water body, is located 1.59 miles downstream via intermittent waters (NMAC 20.6.4.98) from the proposed drill site DH05. A Forest Service GIS layer which references “Colo Div Wildlife Conservation Pop, April 2009” indicates that Macho Creek supports a community of Rio Grande Cutthroat Trout approximately 1240 ft downstream from the confluence of the confluence of the intermittent waters and Macho Creek. Rio Grande Cutthroat Trout require clean, cold water, ample riparian cover, and diverse in-stream cover to survive (http://www.wildlife.state.nm.us/fishing/native-new-mexico-fish). In conjunction with proposed drill site BMPs, surface water associated with any drill site disturbance will be mitigated.

CHAPTER 5. WATER USE

5.1 POINTS OF DIVERSION

The POD refers to the legal location where water is diverted from its source. PODs may come in the form of a well, diversion dam, or other structure. There are over 18,000 PODs in Santa Fe County and nearly 4,400 in San Miguel County (New Mexico Office of the State Engineer 2019). The median well depth for these PODs in Santa Fe County is 150 feet, and 160 feet in San Miguel County. In Santa Fe County, the median depth to water is 36 feet, and in San Miguel County it is 33 feet (period of record 1950–2019). Generally, these PODs are mostly domestic wells used for irrigation and drinking water purposes.

The POD nearest the project is the well associated with right UP00826. Comexico will propose to use up to 3 acre-feet of water from this POD via a temporary water use application with the New Mexico Office of the State Engineer. The next nearest points of diversion are located 2 to 3 miles away, along the Pecos River.

Potential impacts to groundwater are discussed in Section 7.3 of this report. As noted there, while groundwater is present at the site, but likely associated with discrete fracture zones of the Precambrian rocks. Widespread connectivity to distant PODs is possible but not likely, given the discontinuous presence of groundwater in specific fractures and the fact that the well drilled at the site encountered water only in a very limited fractured zone, over 200 feet deep. The water use at the POD associated with water right UP00826 is not likely to affect the nearest PODs 2 to 3 miles away; the source of water for these PODs is likely more closely tied to the Pecos River.

5.2 MAJOR PUBLIC WATER SYSTEMS IN THE AREA AND THEIR WATER SOURCES

Major public water systems in the vicinity of the project site are listed in Table 10.

Table 10. Public Water Systems Near Project Site

Public Water System	System Identifier	Location Relative to Project Site	Water Source	Population Count
Panchuela Campground	NM3501625	6.5 miles northeast	Groundwater	25
Jacks Creek Campground	NM3590925	6.5 miles northeast	Groundwater	250
Tres Lagunas Homeowners Association	NM3500725	2.5 miles east	Groundwater	52
Black Canyon Campground	NM3594226	6 miles east	Groundwater	50
Santa Fe Ski Basin	NM3593526	6 miles northwest	Groundwater	1,500

Source: NMED (2019)

CHAPTER 6. REGULATORY FRAMEWORK

6.1 CLEAN WATER ACT

In 1972, the Clean Water Act (CWA) was established with an objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." New Mexico's water quality standards define surface water quality goals by establishing designations for specific uses of rivers, streams, lakes, and other surface waters. The criteria, set by the Water Quality Control Commission (WQCC), protects these uses as well as preserves water quality in the state. After the WQCC determines standards, the EPA either approves or denies these standards under the CWA.

Section 303(d) of the CWA requires all states to analyze on a bi-annual basis state waters to determine if these waters are in compliance with EPA and State standards (The Business Water Task Force 2010). Water bodies may not meet established standards or may fail in the near future; therefore, they are considered impaired and listed on the 303(d) list. Total Maximum Daily Loads (TMDLs) have been and are being developed within the Upper Pecos watershed, but these are located well downstream from the project site.

Drilling activities at the site would need to be in compliance with CWA requirements. Primary regulation of drilling activities would be through the requirement for a permit under Section 402 of the CWA, which is required for potential discharges to waters of the U.S, including stormwater runoff. Drilling activities likely would be permitted under the Construction General Permit; this permit is only required if the combined disturbance area exceeds 1 acre. In New Mexico, this permit is administered through the EPA under the National Pollutant Discharge Elimination System (NPDES). A typical Construction General Permit requires notification only, and preparation and adherence to a Stormwater Pollution Prevention Plan (SWPPP). If required, Comexico may be required to obtain an Industrial Stormwater Permit for proposed activities.

Drilling activities could also require permitting under Section 404 of the CWA, but this only applies if "dredge and fill" activities occur within a jurisdictional water of the U.S.; if needed this permit is administered through the U.S. Army Corps of Engineers.

6.2 NEW MEXICO GROUNDWATER REGULATIONS

Drilling activities may encounter groundwater during the drilling process. Therefore, the New Mexico Office of the State Engineer has authority over the supervision, measurement, appropriation, and distribution of all surface and groundwater in New Mexico. Part of this authoritative oversight includes the regulation of the construction, repair, and plugging of groundwater wells, pursuant to the provisions of 19.27.4 New Mexico Administrative Code (Well Driller Licensing; Construction, Repair and Plugging of Wells) as required by the New Mexico Office of the State Engineer. Specifically, New Mexico Administrative Code 19.27.4 provides guidelines on the drilling and plugging of wells. The drilling associated with this project will follow these regulations in order to comply with New Mexico regulations.

6.3 NEW MEXICO WATER RIGHTS FRAMEWORK

All waters in New Mexico belong to the public and only those with water rights can legally use water; this includes both groundwater and surface water. Older water rights have priority and during shortages junior owners could potentially receive shortened allotments. It is up to the State Engineer to protect existing water rights from effects of future appropriation. The State of New Mexico requires beneficial uses for all water rights holders. There is no specific definition for “Beneficial Uses;” however it refers to irrigation or domestic, commercial, and industrial uses (The Business Water Task Force 2010). Under certain conditions owners can forfeit their water rights for non-use or for wasting water.

Under the “federal reserve” water right doctrine, it is generally held that the federal government has water rights necessary to fulfill the purposes for which certain lands were reserved by Congress—i.e., wildlife refuges, military bases, Native American reservations, national parks and forests, and wilderness areas. When necessary, these water rights are generally adjudicated through state legal proceedings.

There are currently eight interstate compacts that govern water use from sources that cross state borders. A nine-member Interstate Stream Commission (Commission) was developed to protect New Mexico’s water rights under interstate compacts and is responsible for planning and ensuring the States’ compliance with compacts. The Secretary of the Commission is the State Engineer, who oversees its staff.

The Commission develops state water plans every 5 years, assessing water resources, monitoring groundwater, and evaluating stream-flow measurement since 1987 (The Business Water Task Force 2010).

There are 22 Native American tribes and Pueblos in New Mexico and each has senior water rights. Pueblo water rights were given by Mexican and Spanish governments and later confirmed by the U.S. government when New Mexico was acquired in 1848. New Mexico’s water code and the federal law did not quantify the amount of water allocated to Tribes and Pueblos. The lack of quantifications of Native American water rights is one of the State’s largest ongoing issues.

6.4 SOLE-SOURCE AQUIFERS

The project site is located 2.2 miles east of the sole-source aquifer Espanola Basin Aquifer System in northern New Mexico. The aquifer is within the Rio Grande Rift and is aligned generally north and south, extending from Colorado to Mexico. Studies indicate that the sediments filling the Espanola Basin comprise an aquifer system containing the drinking water for most residents in the basin. The basin is currently under stress from drought and human activities. New Mexico is currently monitoring water resources from the basin to better understand water quality, regional groundwater flow, and water storage.

CHAPTER 7. POTENTIAL IMPACTS FROM DRILLING

7.1 PREVIOUS PERMITTING

A series of historical files provided by Comexico were reviewed to identify past permitting efforts and any outcomes pertinent to water resources (Comexico 2019). Several previous permitting efforts were identified:

- In 1999, a minimum impact exploration permit was requested from the New Mexico Mining and Minerals Division for the "Jones Hill Minimum Impact Exploration Project" (Permit No. SF008EM). The permit was granted on June 3, 1999. Later inspections after expiration and termination of the permit suggest that exploration work had not occurred.
- A previous minimum exploration permit appears to have been granted on August 23, 1995 (Permit No. SF006EM).
- In June 1993, a plan of operation for exploration work for Champion Resources was approved by the U.S. Forest Service. An environmental assessment was completed in August 1992 to support approval of the plan of operation.
- In 1981, a special use permit (with several amendments) was approved by the U.S. Forest Service. One of these amendments was specifically for installation of the water well at the project site.
- In 1981, an application to appropriate underground waters was approved by the New Mexico Office of the State Engineer (Right No. UP00826), for prospecting or development of a natural resource.

In reviewing the previous permits and applications, the primary water concerns at the site appear to be related to surface water, not groundwater. For surface water, the concerns are control of erosion, stormwater quality, and implementing appropriate reclamation. For example:

> As noted by the U.S. Forest Service in 1992: "Due to concerns regarding past activities that were not adequately monitored and resulting erosion/ sedimentation, an important objective for this proposal is to ensure that mitigation and monitoring requirements will improve existing conditions and comply with current standards."
>
> As noted by New Mexico Environment Department, Surface Water Quality Bureau in 1992: "…existing roads and drill pads may have increased the volume of sediment delivery to both stream systems [Macho Creek and Indian Creek]. Serious rills, gullies, and headcuts, some in excess of 24" deep are features of the existing exploration road network. In some locations, sediment transport from exploration road networks and drill pads have accumulated to depths sufficient to have killed native vegetation."

The conditions considered under previous U.S. Forest Service plan of operations and special use permits to prevent degradation included a number of mitigation measures and best management practices intended to prevent surface water concerns. One way to mitigate potential contamination to surface water is to complete road mitigation and maintenance to limit the amount of sediment entering the system. The U.S. Forest Service technical publication titled *Drain Dips, Waterbars, Diverters, and Open-Top Culverts—Surface Water Drainage of Low-Volume Roads* provides guidance for at-grade features for surface water drainage on low-volume roads (U.S. Forest Service 2014). Additional mitigation measures and best management practices may include:

- Installing water bars on roads

- Reshaping drill pads to provide desirable drainage after closure
- Reshaping proposed overland routes after completion to near-natural contours
- Completing access road maintenance on existing U.S. Forest Service Level 1 and 2 roads
- Revegetation to meet 70 percent of adjacent ground cover
- Reseeding and spreading of slash

7.2 PROPOSED ACTIVITIES

At this time, the proposed activities include both non-surface-disturbing geophysical sensing techniques, and exploratory drilling.

7.2.1 Geophysics

For surface geophysics, the current operating procedures include the following aspects pertinent

to hydrogeology:

- All surveying is non-ground-disturbing
- Surveying uses only existing roads, which Comexico has been authorized to use (see Section 7.2.2.1)
- Operating small, portable generators and vehicles
- No trees or vegetation will be cut down

7.2.2 Exploratory Drilling

Exploratory drilling would include the following components:

- Drill up to 30 boreholes via diamond drilling and/or reverse circulation drilling methodologies. The proposed borehole diameter is 3 to 5.5 inches depending on drilling methodology, and proposed borehole depths are in a range of 500 to 4,000 feet.
- Proposed disturbance will be limited to areas of existing roads and/or former disturbance (see Section 7.2.2.1). The approximate area proposed to station a drill rig upon a borehole location is 50 × 30 feet (diamond drill) or 60 × 40 feet (reverse circulation drill). All proposed surface-disturbing activities are intentionally sited to be located where existing roads, historic roads, or historic drill pads have already disturbed the soil.
- Total cumulative disturbance of up to 7.72 acres is proposed, 5.45 acres of which is a stretch of 3 miles of existing Forest Service road with proposed erosion control maintenance. Minor overland routes upon historic tracks and minor earth grading at drill rig stations is proposed. All proposed surface-disturbing activities are intentionally sited to be located where existing roads, historic roads, or historic drill pads have already disturbed the soil.
- Equipment proposed includes pickup trucks, a trailer or cargo truck, a track-mounted excavator, a skid steer loader or equivalent, a water truck, a flatbed truck, a core drilling rig, a reverse circulation rig, an all-terrain vehicle/utility task vehicle, two 3,000-gallon water tanks, a water pump, a bean pump, a light tower/generator, portable toilets, a portable toilet service truck, a backhoe, a grader, a bulldozer.

- Drilling would use water from the on-site well.
- The upper 5 to 20 feet of the hole would be cased with temporary surface casing during drilling. This would be removed during hole abandonment.
- A 100 by 100 foot (0.23 acres) area proposed for parts and materials storage as well as water truck turn around is proposed near the water well location.

- Drilling fluids would be used to facilitate cuttings removal, reduce friction on the bit, cool the drilling bit, reduce or prevent groundwater inflow, reduce or prevent fluid outflow to the environment, and provide for a stable borehole. A specific goal of using the drilling fluid is to create a filter cake in the borehole that would prevent loss of drilling fluid to the environment.
- Drilling fluid would be a mixture of fresh water and various additives. Common additives include bentonite, drilling foam (used as a surfactant to plug or seal zones with lost circulation), or polymers (used to stabilize the borehole).
- Drilling fluid preparation is conducted in a containment tank.
- All boreholes would be closed or abandoned in compliance with New Mexico regulations. All disturbed surface areas would be managed as per the likely stormwater permit and reclaimed as required under any permits.

7.2.2.1 *Access Routes and Anticipated Level of Traffic*

Comexico has access to the area via Indian Creek using a private easement through five parcels of land and then via Forest Road 192, as authorized by the U.S. Forest Service. In addition to Forest Road 192, other National Forest System roads that may be used include Forest Road 120, 120K, 120KA, 120KB, 120KBA, 120KC, 120KD, 120KDA, and 120KE. Total road use proposed by Comexico to undertake exploration drilling operations is as follows:

- Indian Creek private easement: 0.7 mile
- Existing Forest Service road: 5.3 miles
- Overland routes, upon decommissioned road prisms and pioneer routes: 0.2 mile

The proposed Comexico exploratory drilling operation would require the following traffic:

- Daily access via pickup truck, estimated as one truck per drill crew per shift and one truck per day for a project geologist.
- A water truck is proposed to deliver water to the operating drill rig using the on-site well, which is located an average of approximately 0.5 mile from any given proposed drill location.
- Additional periodic access is required for initial drill rig mobilization and setup, the skid-steer/forklift, earth-moving equipment, portable toilet delivery and regular cleanout, a vacuum truck to dispose of drill fluids, and by a drill crew foreman twice per week via pickup truck.

7.2.2.2 *Planned Road Improvements and Best Management Practices*

7.2.2.2.1 CURRENT ROAD CONDITIONS

The National Forest System roads at the project area will support these activities with minimal earth work required. These roads are each listed as Maintenance Level 2 as described in the Santa Fe National Forest Travel Analysis Report and supporting documentation (USFS 2008a). Maintenance Level 2 roads are described as follows (USFS 2008b):

> Level 2 roads are suitable only for high clearance vehicles. Most of these roads are open to the public; anyone can drive on them, but they are not suitable for passenger cars. There are some

> Maintenance Level 2 administrative use roads that are not open to the public but available for Forest Service use or for use by people who hold Forest Service special use permits or road-use permits. . . . Level 2 roads are used for many activities including mineral extraction, camping, hunting, and by people out for a drive. Generally, we do not maintain these roads or we maintain them to minimum standards. Many are rutted and eroded and are difficult to drive, even in a high clearance vehicle. Some roads that were built for passenger cars have deteriorated, because of lack of maintenance, into roads that are suitable only for high-clearance vehicles.

The activities Comexico proposes could increase the Average Daily Traffic (ADT) by as much as five in the primary access portions of the road network and by as much as 10 on select roads within the proposed drill area. In general, Level 2 roads are low-volume roads defined as having ADT less than 400. The traffic increase due to the Comexico project is consistent with current road maintenance levels.

In a site visit conducted on August 1, 2019, U.S. Forest Service personnel identified access roads Forest Roads 192 and 120 as having areas requiring maintenance and suggested that Comexico propose a maintenance plan prior to drilling operations. Comexico will be submitting a maintenance plan to address those portions of the roads that have been identified as requiring maintenance. The following items are likely to be included in the maintenance plan in order to reduce erosion and sedimentation associated with road use.

Comexico has identified approximately 24 culverts along the access route. These are typically 18 to 24 inches in diameter, many of which are plugged or blocked off. The culvert blockages appear to be a significant factor in the roads' current condition; where a culvert is blocked off, water meant to be diverted through that culvert is instead running down the road, incising the surface with ruts and rills. All of the culvert blockages and the majority of the road damage is west of the junction of Forest Roads 192 and 120, or where the access is at its steepest. Approximate culvert locations are shown in Appendix D.

The following characteristics were observed in the field by Comexico:

- Forest Road 192 and Forest Road 120 to the old camp/well: 2.6 miles at 8.6% grade, with an average culvert spacing of 560 feet. This route can be broken down more specifically in several segments:
    - Forest Road 192 to Forest Road 120: 1.0 miles at 6% grade, with an average culvert spacing of 900 feet
    - Forest Road 120 to the old camp/well: 1.6 miles at 10.3% grade, with an average culvert spacing of 420 feet. The first 0.5 mile of Forest Road 120 is of the most concern, at 14.3% grade, with an average culvert spacing of 340 feet
- The road is not bermed on either side and is generally crowned in shape but is also sometimes outsloped or insloped

7.2.2.2.2 PLANNED ACTIVITIES FOR FOREST ROADS

In order to undertake pre-operation maintenance on this portion of National Forest System road, Comexico would submit a maintenance plan along the lines of the following:

- Clean those culverts that are plugged or partially plugged. Material removed would be considered for use on the road.
- Clear portions of the ditches leading to the culverts. Material removed would be considered for use on the road.

- Grade the ruts and rills from the damaged road; when grading, reduce insloping of roads and favor either a crown-shaped or outsloped road shape. Compact roads following grading.
- Clear minor brush and overgrowth (not excessively), leaving grasses.
- Harden and re-protect the culvert inlets and outlets from future erosion using native and erosion resistant materials. Filter fabric would be considered where appropriate.
- Construct cross-drain features (waterbars, etc) between the culverts with spacing according to table 11, below.
- Avoid and prevent side casting of material from the roadway into the valley bottoms.
- Construct nondrivable waterbars at any road junction between the access route and those roads which Comexico has not proposed to use, or at those which Comexico have committed to refrain from using.
- No road widening would be conducted during any of the grading.
- Roadways would be inspected regularly for indications of erosion.
- Undertake any USFS required maintenance at the end of the less than 12-month mechanized operation period, such as maintaining surface drainage features, blocking road access.
- Regulate traffic during wet periods.

Table 11. Spacing for Cross-Drain Features to Reduce Erosion

Road Grade %	Surface Drain Type	Low-Erosive Soils* (feet)	Erosive Soils† (feet)
0-3	All	400	150
4-6	All	325	125
7-9	All	250	100
10-12	All	200	75
12-15	All except drain dips	150	65
16-20	All except drain dips	115	50

Note: Adapted from Packer and Christensen (1964) and Copstead et al. (1998).

* Low-erosive soils = coarse rocky soils, gravel, and clay.

† Erosive soils = fine friable soils, silt, and fine sands.

7.2.2.2.3 PLANNED ACTIVITIES FOR OVERLAND ROUTES

Proposed overland routes located on decommissioned road prisms and pioneer routes would be used for accessing four proposed drill pad sites, and total 0.2 mile in combined length (see Appendix D). The average grade of the total combined length of these overland routes is 8.7%. If Comexico implements operations on anyof these routes, it proposes to scrape the route of its thinly developed topsoil, setting it aside for use in reclamation, and to construct crest-only water bars along these routes, angled off the downhill slope, every 50 feet to divert any flowing surface water off of the route. This proposed design would allow for drivability via high clearance vehicles during operations as well require as a minimum amount of earthwork, reducing the potential for adverse impacts to surface waters. Driveable crest-only waterbar height is generally 0.5 to 2 feet (Keller and Sherar 2003; U.S. Forest Service 2014). No widening of any road prism or pioneer route is proposed for overland routes.

7.2.2.2.4 PLANNED ACTIVITIES FOR DRILLING SITES

Drilling locations have been proposed as 32 potential drill pads having dimensions of either 50 x 30 feet or 60 x 40 feet, depending on location and drilling type. These general dimensions will support positioning of a drill rig, a night-time operating light, a mud pump, mud tanks, drill pipe, and erosion control features. Up to 30 of the 32 proposed pad locations may be implemented upon..

Twenty-eight of the proposed drill pads are accessed and located upon a National Forest System road, and four of the proposed drill pads are accessed and located upon decommissioned road prism or pioneer route (see Appendix D). At each of the 32 drill pads, if used, surface features would be constructed and located so that any soil movement from the operation, both during and after, is minimized. Erosion control measures would be planned to effectively stabilize the area using grading to control water flow, water bars, and revegetation or other ground cover. Surface disturbance requirements at any given drill pad are minimal.

Comexico would employ drill rigs built on rubber tracks which are highly maneuverable on rough terrain and anticipated to perform well upon existing roads. The rubber tracks disperse the mass load of the machinery across a large surface area and its slow maximum speed ensure there is no road damage. These rigs also come equipped with outriggers to help level the rig at the drill pad, therefore minimizing ground leveling required. If any proposed drill pad surface grading or minor excavation occurs, the removed material will be stockpiled and enclosed behind a barrier so that potential stormwater runoff cannot interact with the sediment. Upon finalizing the use of any drill pad, any change to the surface will be regraded back to its original contours and cross-drain features will be constructed. Downslope features will be placed on any outsloped portions of roads or drill pads, such as manufactured biodegradable wattles, slash, or logs and installed to prevent sediment from reaching surface drainages after operations.

The average borehole depth proposed for this drill program is about 1,600 feet. The average borehole will require about 8.5 days to complete, using a single rig with a two-shift operation (22 hours per day), from setup to hole completion and plugging.

Comexico have determined that using lined mud pits at the drill pad sites, and burying all mud material at the proposed drill site upon reclamation is the most practical approach to reduce likely complications in retrieving the mud after each hole and transporting the mud offisite. Mud pits are a standard operating procedure in the exploration drilling practice and will be managed via BMPs as outlined in the Exploraiton Permit application.

Once it is determined that a drill pad which has been implemented upon is no longer needed for future use within the proposed drill program, the removed topsoil will be replaced, an approved seed mix will be planted, crest-only waterbars will be maintained, and, if an overland route, the access will be blocked using a non-drivable waterbar.

All mechanized operations, from road maintenance, drilling, and reclamation, would be complete in less than 36 months from implementation. Renewals to the MMD Exploration Application and others would be obtained as needed.

7.3 POTENTIAL IMPACTS TO GROUNDWATER

The current proposed geophysical activities would have no impact on groundwater resources, as a limited amount of water will be used and no potential for discharge to groundwater exists.

With respect to drilling impacts, multiple lines of evidence suggest that groundwater is present at the site, but likely associated with discrete fracture zones of the Precambrian granitic rocks. Sensitive waters in the larger area include perennial flow in Indian Creek, Macho Creek, or the Pecos River, and these waters are likely to have a degree of interaction with groundwater in the area. However, impacts to these sensitive perennial surface waters from drilling operations would not occur for the following reasons:

- Widespread connectivity to distant water sources is possible but not likely given the discontinuous presence of groundwater in specific fractures. The well drilled at the site (UP00826) encountered water only in a very limited fractured zone, over 200 feet deep.
- The nearest perennial waters are not in the immediate vicinity of the project site. The nearest perennial water (Indian Creek) is located about 1 mile away, and the Pecos River is located about 2.5 miles away. Likewise, the nearest public water supplies are located at least 2.5 miles away. There are three areas near or within the project area that were identified as springs; these appear to be primarily seeps that contribute to seasonally wet areas. None of these springs are associated with water supplies, hydroriparian areas, or appear to provide standing water for wildlife.
- While drilling techniques vary, in general exploratory drilling does not result in substantial discharge of any fluid to the aquifer. Drilling mud may be used and may enter the aquifer but is generally confined to a small area around the borehole, and only where fractures may exist. Substantial aquifers encountered during drilling, while not likely, can also be appropriately sealed off if necessary. For low-impact drilling operations, mud pits are generally self-contained and not allowed to infiltrate, and mud and any other waste fluids are disposed appropriately off-site after completion. Spring #1 and Spring #2 that were identified on site are located about 300 feet from the nearest drill pad; temporary impacts to the aquifer during drilling could occur in the immediate vicinity of the borehole, either fluctuations in water levels or the presence of drilling mud. These effects would be unlikely to extend to springs 300 feet away. Prolonged pumping or aquifer testing would have the potential to reach these springs, but none of these activities are proposed.

These conclusions are consistent with the analysis conducted and decisions made under previous permitting at the site.

7.4 POTENTIAL IMPACTS TO SURFACE WATER

The current proposed geophysical activities would have no impact on surface water resources. No ground disturbance or vegetation removal would occur that would have the potential to contribute sediment or other pollutants to downstream surface waters. To the extent that fuel might be used for portable generators or vehicles, storage is likely to be in small quantities, use of best management practices (see BMP Table A, supplement to the Plan of Operations and Exploration Application) would minimize the possibility of spills, and the limited magnitude of any spills would be unlikely to migrate downstream.

Exploratory drilling is primarily a concern for the reasons identified during previous permitting, specifically the potential for removal of vegetation, surface disturbance, unprotected disturbed soil, excessive erosion, and sedimentation to downstream waters during runoff events. Soils in the project area have moderate to severe susceptibility to erosion. However, all of these issues are preventable provided that best management practices are followed and sediment controls are employed.

The best management practices and road maintenance activities described above would both remedy current conditions of the existing roads that cause ongoing erosion and downstream sedimentation and also effectively prevent drilling-related activities from causing additional erosion or soil loss. No negative impacts to surface waters from soil loss or erosion would occur.

CHAPTER 8. LITERATURE CITED

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APPENDIX A

Driller's Log for UP00826 Well

APPENDIX B

Water Rights Identified within 10 Miles of Project

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00826	PRO	CHAMPION RESOURCES, INC.	Shallow	510
UP 04171	EXP	TRES LAGUNAS HOMEOWNERS ASSOC	Shallow	4471
UP 03704	DOM	CARLOS N GONZALES	Shallow	4473
UP 02394	DOM	VIRTIE L. LOUGHRIGE	Shallow	4518
UP 03803	DOM	PECOS PLACE LIMITED	Shallow	4538
UP 01282	COM	TRES LAGUNAS HOMEOWNERS ASSOCI	Shallow	4621
UP 01667	DOM	MARK MCFERRIN	Shallow	4718
UP 01668	DOM	RIVER BEND RANCH LLC	Shallow	4766
UP 02863	DOM	RIVER BEND RANCH LLC	Shallow	4793
UP 03829	DOM	SCOTT D RICE	Shallow	4867
UP 02590	DOM	THOMAS M & PAMELA BELL	Shallow	4927
UP 01717	DOM	JAMES E. TICER III		4929
UP 04756	MON	NM DEPARTMENT OF GAME AND FISH		4965
UP 03535	DOM	HUGH H. LEY		5023
UP 04756	MON	NM DEPARTMENT OF GAME AND FISH		5095
UP 00957	PRO	INC. SANTA FE MINING	Shallow	5147
UP 01688	DOM	VIRGINIA T NYDES	Shallow	5225
UP 02250	DOM	MARK MCFERRIN	Shallow	5338
UP 04164	DOM	STEVEN CHAVEZ	Shallow	5385
UP 04480	DOM	STEVENSON FAMILY LTD PTNRSHP		5446
UP 03384	DOM	PATRICIA RIVERA	Shallow	5544
UP 04378	DOM	DARYL CORDOVA	Shallow	5617
UP 02147	DOM	FRED A. LOPEZ	Shallow	5646
UP 04751	DOM	HIDDEN VALLEY RANCH	Shallow	5681
UP 03328	DOM	JACK SECKINGTON		5754
UP 00965	DOM	MARK E. MCFERRIN	Shallow	5895
UP 04022	DOM	MADTSON SURVIVORS TRUST	Shallow	5903
UP 01918	DOM	KENNETH MELENDEZ	Shallow	5950
UP 02252	DOM	ROSS SNYDER	Shallow	6001
UP 02010	DOM	ERNIE HARDING	Shallow	6071

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00735	DOM	JACK MARTIN	Shallow	6122
UP 03062	DOM	STEPHEN NELSON	Shallow	6123
UP 04176	DOM	LELA MCFERRIN	Shallow	6148
UP 04756	MON	NM DEPARTMENT OF GAME AND FISH		6278
UP 01392	DOM	WAYNE EDWARD BRIDGE	Shallow	6296
UP 01133	DOM	GILBERT BLEA	Shallow	6301
UP 03367	DOM	CLYDE ALEXANDER	Shallow	6322
UP 04756	MON	NM DEPARTMENT OF GAME AND FISH		6374
UP 04570	DOM	JAMES ROYBAL	Shallow	6393
UP 04756	MON	NM DEPARTMENT OF GAME AND FISH		6427
UP 02975	DOM	JUDITH ALLISON	Shallow	6495
UP 03011	DOM	DAVID WRIGHT	Shallow	6495
UP 00954	DOM	MIKE ROBLES	Shallow	6503
UP 00955	DOM	JACK S. & MIRIAM P. MALM	Shallow	6503
UP 00958	DOM	ROBERT W. DAY	Shallow	6503
UP 04681	MUL	JACK H. O'BANNON	Shallow	6565
UP 03965	DOM	KENNETH P ECKEL JR	Shallow	6584
UP 03975	DOM	RITA HEMSING	Shallow	6645
UP 04719	DOM	FRANK F. GARCIA		6677
UP 04752	DOM	MICHAEL SIMS	Shallow	6703
UP 00393	DOM	FRED HERRERA	Shallow	6721
UP 02128	DOM	NEAL HINKEL	Shallow	6765
UP 03211	DOM	REYES & CORDELIA GARCIA		6778
UP 04381	DOM	JEAN JENKINS	Shallow	6931
UP 01100	DOM	JULIE K. HERSH QUALIFIED RESIDENCE TRUST	Shallow	7054
UP 03188	DOM	FRANCISO LUJAN		7214
UP 02799	DOM	KATHERINE O BARNES	Shallow	7335
UP 02800	DOM	ROBERT H BARNES	Shallow	7384
UP 04181	MUL	ROBERT K CASADOS	Shallow	7620
UP 03878	DOM	SWANK LLC	Shallow	8069

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 03068	MUL	ELOY GONZALES	Shallow	8484
UP 03684	DOM	JUDE R GONZALES		8883
UP 01580	DOM	JOSE M. ORTEGA	Shallow	9334
UP 02105	EXP	JOHN J. MCCARTHY		9360
UP 01983	DOM	J. NESTOR VILLAS	Shallow	9371
UP 02098	DOM	LOUIS F. NARVAIZ		9417
UP 00632	DOM	J. G. VALENCIA	Shallow	9496
UP 01251	MUL	J.L. DOSSEY	Shallow	9503
UP 04278	DOM	LEONARD GRIEGO	Shallow	9579
UP 00209	DOM	GEORGIA TINKER		9636
UP 01948	DOM	KENNETH E. & SARAH L. FOSTER	Shallow	9683
UP 02458	DOM	NOREEN PURCELL	Shallow	9683
UP 03285	DOM	LEONARD J GRIEGO		9683
UP 02093	MUL	GUADALUPE T LUCERO ROYBAL	Shallow	9849
UP 04655	MUL	EAST PECOS VENTURES LLC.		10039
UP 03216	STK	DBA COW CREEK RANCH MARTIN'S RANCH		10346
UP 03215	SAN	COW CREEK RANCH	Shallow	10352
UP 03217	STK	DBA COW CREEK RANCH MARTIN'S RANCH		10663
UP 03805	DOM	ELLEN KENNEY	Shallow	10671
UP 03030	DOM	DON GORMAN	Shallow	10733
UP 03616	DOM	STEPHEN C. EHRMAN	Shallow	10779
UP 03406	DOM	USDA SANTA FE NATIONAL FOREST	Shallow	10808
UP 03627	DOM	WILBUR MCNEESE		10808
UP 03983	DOM	LOURDES LARRANAGA	Shallow	10838
UP 01166	DOM	RUBEN ARMIJO	Shallow	10839
UP 03270	DOM	MURIEL S PEEBLES		10893
UP 01334	DOM	DON RUSHING	Shallow	10897
UP 04494	DOM	RHONDA MAIN	Shallow	10979
RG 96680	CLS	FRANCINE JACQUEZ		11008
UP 04727	DOM	FRANCINE JACQUEZ		11008

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00633	MDW	LA POSADA MDWCA	Shallow	11017
UP 03926	DOM	RON ARMIJO		11017
UP 03853	DOM	FRED L RIBE	Shallow	11024
UP 01977	DOM	ROBERT D. WHITMAN	Shallow	11073
UP 04604	DOM	SANTA FE NATIONAL FORREST	Shallow	11081
UP 04716	DOM	JENNIFER BACA	Shallow	11099
UP 04547	DOM	GLEN ANDREWS	Shallow	11145
UP 03788	DOM	RUDY P ARCHULETA	Shallow	11157
UP 03620	DOM	PHILLIP R GREEN	Shallow	11286
UP 01683	DOM	MARY LYNN MCGUIRE	Shallow	11371
UP 02563	DOM	ROGER FREIDMAN	Shallow	11380
UP 04551	DOM	ALEX W PADILLA	Shallow	11415
UP 00878	DOM	BILL MCSWEENEY	Shallow	11462
UP 04270	DOM	LOS PUEBLOS ALTOS CORP	Shallow	11550
UP 03901	DOM	KAY S GEARY		11583
UP 02874	DOM	LOUIS BACA	Shallow	11608
UP 04315	DOM	JEANETTE LYSNE	Shallow	11621
UP 02671	DOM	JEROME A HANDS	Shallow	11649
UP 00370	DOM	HAROLD O. & GENEVIEVE ELLIS		11700
UP 00475	DOM	JOHN JOHNSON	Shallow	11700
UP 00496	DOM	HAROLD O. ELLIS AND GENEVIEVE	Shallow	11700
UP 04722	DOM	JEAN A. BUSTAMANTE	Shallow	11711
UP 03192	DOM	MELVIN LUJAN		11750
UP 02665	DOM	MACK MARRS	Shallow	11779
UP 00484	DOM	JIM PENDERGRASS	Shallow	11826
UP 01272	DOM	WILLIAM L. ECKERT	Shallow	11890
UP 03536	DOM	HUGH H. LEY		12004
UP 03596	DOM	DAVID LUNT	Shallow	12052
UP 01492	DOM	U.S. FOREST SERVICE PECOS DIV	Shallow	12075
UP 04772	DOM	POSADA LAND AND CATTLE COMPANY		12130

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00096	DOM	HENRY H. CAREY		12139
UP 00754	DOM	JERRY L. LEWIS		12171
UP 00848	DOM	JAY BURTTRAM		12199
UP 03892	DOM	ELLEN J KING	Shallow	12200
UP 00019	DOM	JOAN WILLIAMS PATRICK	Shallow	12241
UP 03656	DOM	US FOREST SERVICE PECOS DIVISION	Shallow	12298
UP 03968	DOM	JOSEPH SANDOVAL	Shallow	12304
UP 01119	DOM	UNITED STATE OF AMERICA	Shallow	12349
UP 03166	DOM	J H BURTTRAM	Shallow	12358
UP 03097	DOM	JAMES J GONZALES	Shallow	12388
UP 00919	DOM	MARY ALEXANDER CARTER		12463
UP 03672	DOM	TED RIVERA	Shallow	12556
UP 04407	DOM	LAND ASSETS FPL	Shallow	12611
UP 03171	DOM	CHRISTINA MEDINA		12620
UP 03102	DOM	MAX C BACA		12628
UP 03755	DOM	PATRICK D. CHAPMAN		12640
UP 00157	DOM	JAMES E. SPERLING	Shallow	12667
UP 04522	DOM	JAMES JOSEPH BUSTAMANTE	Shallow	12688
UP 01375	SAN	SANTA FE NATIONAL FOREST	Shallow	12693
UP 02389	DOM	T.H. MCELVAIN		12728
UP 01511	DOM	ROBERT JACKSON	Shallow	12760
UP 00385	SAN	UNITED STATE FOREST SERVICE	Shallow	12785
UP 02682	DOM	ALBERT GONZALES	Shallow	12850
UP 02998	DOM	S.J. BUSTAMANTE	Shallow	12874
UP 00899	DOM	KING LAUGHLIN	Shallow	12884
UP 00532	EXP	N.M. DEPT. OF GAME & FISH		12918
UP 00619	DOM	JOEL SALISBURY	Shallow	12936
UP 03433	STK	ELIZABETH G. CHAPMAN		12989
UP 01628	MUL	NICK WIMETT		12997
UP 03432	DOM	ELIZABETH G. CHAPMAN	Shallow	13015

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 03418	DOM	JOSEPH A GONZALES		13035
UP 02544	DOM	STEVEN P ROWE		13054
UP 04172	DOM	REINHARD ZIEGLER		13064
UP 03405	STK	MARTIN CONNAUGHTON	Shallow	13088
UP 02345	DOM	MARTIN CONNAUGHTON		13095
UP 02678		FLORENTINO J GONZALES, JR		13132
UP 03095	DOM	FLORENTINO J JR GONZALES		13132
UP 00659	DOM	STEVE ROYBAL	Shallow	13220
UP 03673	DOM	TED A RIVERA III	Shallow	13255
UP 01748	DOM	JOHN STROW	Shallow	13280
UP 00698	DOM	EUGENE ROYBAL	Shallow	13289
UP 04523	DOM	JAMES JOSEPH BUSTAMANTE	Shallow	13354
UP 03799	DOM	FLORENTINO J GONZALES	Shallow	13361
UP 00860	DOM	MARCELLA J. RODRIGUEZ	Shallow	13372
UP 02516	DOM	GUY WILLIAM MCELVAIN	Shallow	13391
UP 02881	DOM	ROBERT MITCHELL CALDWELL		13399
UP 00941	DOM	IRA M. YOUNG	Shallow	13413
UP 01712	DOM	JR., T.H. MCELVAIN	Shallow	13446
UP 00011	DOM	DON SWARTZ	Shallow	13526
UP 01189	DOM	CASDAGLI/LUCAS REV FAMILY TRST	Shallow	13537
UP 02398	DOM	ROBERT SCHREI	Shallow	13629
UP 01496	EXP	GLORIETTA BAPTIST CONF. CENTER		13862
UP 02948	MUL	RAY RUSH	Shallow	13888
UP 03404	DOM	DAVID DEVINE	Shallow	13888
UP 04105	DCN	BEN RUIZ	Shallow	14020
UP 04749	MON	DBS&A	Shallow	14053
UP 01640	DOM	DANIEL & ELIZABETH ROUGEMONT	Shallow	14075
UP 00947	DOM	BOB BERARDINELLI	Shallow	14125
UP 00365	DOM	MARY H. DALY		14241
UP 01855	DOM	ALBERT J. KOEWING III	Shallow	14241

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 02531	DOM	PAMELA SPRINGALL	Shallow	14247
UP 04691	DOM	RICHARD D. ROYBAL	Shallow	14261
UP 01062	DOM	RALPH BALTZLEY		14265
UP 00240	DOM	LINDA STUMPFF	Shallow	14288
UP 04731	DOM	JENNA DECASTRO		14311
UP 00087	DOM	NEDIM C BUYUKMIHCI	Shallow	14339
UP 02112	DOM	MELVIN VARELA	Shallow	14396
UP 03387	DOM	MARIA BORDEN	Shallow	14401
UP 04058	DOM	MARI KOOI	Shallow	14425
UP 02955	DOM	ISIDRO ARMIJO		14426
UP 01061	DOM	DOUG BALTZLEY	Shallow	14499
UP 01365	DOM	MARK J CARUSO AND JUDY CARUSO REVOCABLE TRUST	Shallow	14521
UP 03081	DOM	MARK J CARUSO AND JUDY CARUSO REVOCABLE TRUST	Shallow	14521
UP 01761	SAN	FRANK W. EMERSON	Shallow	14531
UP 00014	DOM	RICHARD VALENCIA	Shallow	14536
UP 00339	DOM	CLIFFORD HAWLEY	Shallow	14581
UP 04707	DOM	RUBEN FERNANDEZ		14611
UP 02972	DOM	EUGENE H LUJAN		14640
UP 02495	DOM	JOHN MARTIN	Shallow	14650
UP 02118	MUL	PETER GRIFFITH		14669
UP 00373	MUN	GLORIETA BAPTIST CONF CENTER		14701
UP 00831	DOM	DEZBAH STUMPFF		14749
UP 01479	DOM	JON / JOHNSON, CAROL ASHER	Shallow	14847
RG 30836	DOM	DOROTHY A BREEDEN	Shallow	14854
UP 00691	DOM	MRS. FRANCES K. TYSON	Shallow	14854
UP 04306	MUL	DOROTHY A. BREEDEN	Shallow	14854
UP 02532	DOM	PAMELA SPRINGALL	Shallow	14864
UP 01632	DOM	SUNDAY SCHOOL BOARD OF THE SOUTHERN BAPTIST CHURCH		14882
UP 04006	MUL	DOUG BALTZLEY	Shallow	14902

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00373	MUN	GLORIETA BAPTIST CONF CENTER	Shallow	14949
UP 04054	DOM	RALPH NAVA	Shallow	15008
RG 30836	DOM	DOROTHY A BREEDEN	Shallow	15019
UP 04306	MUL	DOROTHY A. BREEDEN	Shallow	15019
UP 04714	EXP	GLORIETA 2.0, INC	Shallow	15073
UP 02875	DOM	JOSE L. BACA		15097
UP 03827	DOM	JAMES CONGDON		15144
UP 00360	DOM	BRUCE HAMILTON	Shallow	15178
UP 00601	DOM	JILLIAN JOY DOUGHERTY	Shallow	15191
UP 00745	DOM	WARNER JOHNSON		15193
UP 00880	DOM	UNITED STATES OF AMERICA		15231
UP 01634	EXP	GLORIETA BAPTIST CONF. CENTER	Shallow	15237
UP 00373	MUN	GLORIETA BAPTIST CONF CENTER	Shallow	15286
UP 01634	EXP	GLORIETA BAPTIST CONF. CENTER		15286
UP 03310	DOM	HONEY BOY RANCH	Shallow	15302
UP 04594	DOM	MARSHA DALTON	Shallow	15308
UP 04512	DOM	CHRISTIE S. HARSLEM REVOCABLE TRUST	Shallow	15309
UP 02399	DOM	NANCY DAHL		15320
UP 02571	DOM	SHANE MCMULLEN	Shallow	15330
UP 01631	DOM	SUNDAY SCHOOL BOARD OF THE SOUTHERN BAPTIST CHURCH		15342
UP 03289	DOM	BRIAN & WENDY LUKAS	Shallow	15408
UP 04771	DOM	BERNICE ANN GENTRY		15434
UP 00006	DOM	CHARLES D. BATTS	Shallow	15493
UP 02643	DOM	STEVE NOWLEN	Shallow	15524
UP 03889	DOM	KATHLEEN MANCHESTER		15524
UP 03218	DOM	ISMAEL SENA		15538
UP 04165	DOM	BOB RUEHMANN	Shallow	15587
UP 04125	STK	JOAN HULTGREN	Shallow	15648
UP 03005	DOM	SCOTT W. & BROOKSY Q. RIVERS		15650
UP 01387	DOM	EDWARD E. MERRIFIELD	Shallow	15674

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 02765	DOM	KEN LEWIS	Shallow	15697
UP 03425	DOM	JAMES BULLOK	Shallow	15715
UP 00319	DOM	HELMUTH NAUMER	Shallow	15731
UP 04634	DOM	TITUS ISPIRESCU	Shallow	15738
UP 04021	MUL	CLIFF BALTZLEY		15749
UP 00859	DOM	JOE VALDES	Shallow	15769
UP 04765	DOM	SOPHIA MORALES		15774
UP 00320	DOM	TOM DICKERSON		15807
UP 01711	DOM	DANIEL & MONICA JOHNSON	Shallow	15807
UP 00318	DOM	CARLOS NAUMER	Shallow	15820
UP 02872	DOM	SCOTT W RIVERS	Shallow	15830
UP 03703	DOM	LUPE VARELA	Shallow	15837
UP 04507	STK	ANDY ORTIZ		15842
UP 00373	MUN	GLORIETA BAPTIST CONF CENTER	Shallow	15844
UP 01935	DOM	ADRIAN VIGIL		15867
UP 03944	MUL	MARIE LARSON	Shallow	15884
UP 00086	MUN	VILLAGE OF PECOS	Shallow	15900
UP 04281	DOM	CLASICO LLC	Shallow	15911
UP 00407	DOM	STEVEN DANNUCCI	Shallow	15912
UP 03683	DOM	RICHARD FARRAHER	Shallow	15914
UP 02224	DOM	RICKY CLUNN	Shallow	15921
UP 03659	DOM	LUPE VARELA		15922
UP 00771	DOM	JOE HODGES	Shallow	15924
UP 02256	DOM	RICHARD FISKE	Shallow	15924
UP 01094	MUL	EZRA NATHANIEL HUBBARD	Shallow	15938
UP 01758	DOM	JAYE DEMENT	Shallow	15945
UP 00554	DOM	LARRY LUJAN	Shallow	15953
UP 04738	EXP	GLORIETA 2.0		15964
UP 01718	MUL	BENJAMIN A. & WILMA L. DILLARD	Shallow	15972
UP 04249	DOM	BRIGID CURRAN	Shallow	15989

Water Right File Number	Use	Owner	Water Source	Distance to Project (meters)
UP 00373	MUN	GLORIETA BAPTIST CONF CENTER		16019
UP 01718	MUL	BENJAMIN A. & WILMA L. DILLARD	Shallow	16080

Use Codes

MON = Monitoring well

CLS = Closed File

COM = Commercial

DCN = Domestic Construction

DOM = Domestic One Household

EXP = Exploration

MDW = Community Type Use, MDWCA, Private, or Commercial Supplied

MUL = Domestic Multiple Households

MUN = Municipal, City or County Supplied Water

PRO = Production or Development of Natural Resource

SAN = Sanitary in Conjunction with a Commercial Use

STK = Livestock Watering

APPENDIX C

Conoco Surface Water Quality Sampling (1980–1983)

APPENDIX D

Locations of Specific Road Maintenance to Reduce Erosion/Sedimentation Impacts due to Road Use