

MEMORANDUM

DATE: July 31, 2013

TO: Ms. Brenda L. Clark, P.E., BCEE, CHMM
Senior Environmental Engineer - US Onshore Exploration
US OG/HO Regulatory and Environmental Team
Shell Exploration and Production Company

FROM: Mr. Pat Garland, P.G. and Mr. Devin Girtin, GIT, LT Environmental, Inc.

SUBJECT: Water Monitoring Program for
Camilletti #1-10 Routt County, Colorado
Swan Project - Hayden Unit

Shell Exploration and Production Company (SEPCO) has developed a groundwater baseline monitoring plan for operations it will be conducting in association with the proposed Camilletti #1-10 exploration well (Site). These operations include drilling, completing, and producing the well, but do not include hydraulic fracturing of this well. SEPCO will implement a groundwater baseline monitoring program for its exploration and production facilities included in the Swan Project Area in northwest Colorado. The SEPCO baseline monitoring program is a combination of the Colorado Oil and Gas Conservation Commission (COGCC) Rule 609 Statewide Groundwater Baseline Sampling and Monitoring requirements and some additional elements SEPCO has elected to include in the program. This would include testing of additional parameters and extending the search radius to identify candidate water wells to sample, if needed. Routt County has recently begun to incorporate compliance with Rule 609 into the Special Use Permit (SUP) for newly proposed exploration and production facility locations to align with the COGCC Rule.

MONITORING PRIOR TO DRILLING OF PROPOSED LOCATIONS

Task 1 - Identification of Sampling Locations

Rule 609/Routt County SUP requires SEPCO to attempt to identify permitted water wells or seeps/springs within a one-half mile radius of the proposed drilling locations using the Colorado Division of Water Resources (DWR) online permitted water well database. As directed by SEPCO, LT Environmental, Inc. (LTE) plotted all of the permitted water wells within a one-half mile radius of the Site and reviewed the United States Geological Survey (USGS) topographic map to identify any additional water wells and/or spring/seep locations. At SEPCO's direction, LTE also plotted all of the permitted wells between one-half mile and one mile radius of the site



(Figure 1). After a review of the database and topographic map, only one permitted water well was identified within one-half mile of the Site. The DWR permit #111586 is located cross-gradient/up-gradient of the Site across the drainages for both Cheney Creek and Little Cheney Gulch. Additionally, one natural seep was identified within one-half mile of the Site along the drainage for Little Cheney Gulch.

DWR permits for an additional seventy-five (75) water wells were identified between one-half mile and one mile of the Site (see Table 1).

In accordance with COGCC Rule 609, it is SEPCO's intent to conduct baseline monitoring at the existing permitted water well (DWR permit #111586) and seep/spring located within one-half mile of the Site, provided that approval to access and sample the water well and seep is obtained from the owners. In addition to DWR permit #111586 and the seep/spring, there are eight permitted water wells north of United States (U.S.) Highway 40 and up-gradient of the town of Milner. Two water wells (DWR permit #57623 and #57625) are completed at 20 feet and 60 feet, respectively and appear to be completed in the Rabbit Ears Colluvium. Four of the water wells (DWR permits #126149, #265231, #268335 and #162750) appear to access water in the Iles Formation depths ranging from 115 feet to 340 feet. Completion data for three of the water wells (DWR permits #46361, #57624 and #111586) were not available. DWR records for permitted water well #162750 indicate that the well is completed at 340 feet below ground surface. There are no other permitted water wells within one mile of the Site, including the wells in the town of Milner, which are completed deeper than 340 feet. SEPCO will seek access to the nine permitted water wells and the unnamed seep/spring listed above to conduct baseline groundwater sampling

Water Supply Location Rationale

SEPCO's stated goal is to conduct their operations in a manner that is protective of the environment and the community. In order to develop an understanding of the water source well/sample locations. LTE examined available information relating to the geographic setting, geology, hydrogeology, and water chemistry of the underlying and adjacent geologic formations in the vicinity of the Site.

Specific tasks included in this study are outlined below:

- Characterization of local surface topography, structural geology, stratigraphy, and hydrogeology;
- Characterization of regional groundwater flow systems;
- Evaluation of the relationship between oil and gas producing formations to local groundwater resources;
- Evaluation of the relationship between target oil and gas producing intervals to surface water systems;
- Characterization of the water quality of oil and gas producing intervals, local aquifers, and surface water; and
- Preparation of a summary report.



Surface Topography

The Site will be constructed on a relatively flat area due north of Milner, Colorado, north-northeast of the intersection of U.S. Highway 40 and County Road 48 in rural Routt County, Colorado. The Site is up-gradient from Cheney Creek, a stream that lies to the east and flows to the south-southeast. Figure 1 depicts the topography across the well pad location. The surface flow from the area of the well pad drains to the east-southeast for a short distance toward Cheney Creek. This drainage conveys all surface flow to the south-southwest, where after flowing through Milner, it discharges to the Yampa River approximately one and one-quarter miles downstream.

In the area of the Site, there is limited development of Quaternary alluvium or geologically recent units which cover the Cretaceous age Iles and Mancos formations. Soil reports obtained from the United State Department of Agriculture (USDA) Web Soil Survey website indicate one local soil type at the well pad location: Rabbit Ears loam, which is a colluvium derived from the eroding Iles Sandstone and Shale.

Structural Geology

The proposed Camilletti #1-10 exploration well will be located in the southeastern corner along the eastern margin of the Sand Wash Basin. The Site lies east of the Tow Creek Anticline and Twentymile Park syncline, which trend north-south and askew from the approximate axis of the structural basin which stretches from the town of Yampa northwest to the Wyoming state line where the Cherokee Ridge bounds the basin (Barkmann, 2011). Another major syncline that trends southeast to northwest from the town of Yampa through the town of Hayden splits the basin into two halves, with the stratigraphic units generally dipping toward the center of the basin. The syncline plunges gently to the northwest at an angle that typically does not exceed 15 degrees (Fenneman and Gale, 1906).

A syncline is a fold in the Earth's crust where the rock strata are layered from oldest to youngest as you move from the outside of the syncline fold to the center (axis). An anticline is the reverse occurrence where the youngest rock strata occur on the outside of the fold. Anticlines are common locations for oil and gas exploration as the folded nature of the rock layers can act as high points with "caps" trapping the oil and gas.

The Site lies on the southeastern edge of the Sand Wash Basin in an area that steeply slopes down toward the northeast flank of the Twentymile Park syncline. These structural features control the major bedrock topography in the southeastern corner of the Sand Wash Basin. The proposed Camilletti #1-10 well pad is situated near a northwest-striking fault system encompassing three mapped faults. All three faults are mapped at the surface on USGS Map I-972. The fault nearest the Camilletti #1-10 well pad is down-to-the-southwest at its northern end, forming a graben with the down-to-the-northeast fault just to the south. It also forms a horst block on the north side with the down-to-the-northeast fault just to the north. However, the middle fault closest to the Camilletti #1-10 well pad is a "scissors" fault because it switches off-



set from down-to-the-southwest at its northern end to down-to-the-northeast fault on its southern end. It is still a down-to-the-southwest fault near the Camilletti #1-10 well pad, but likely has diminished in total displacement as it approaches the crossover point in its sense of offset. Due to the folding and faulting along the edge of the basin, there are also localized faults which affect the bedrock structure over a smaller area. Two of these structures exist adjacent to the well pad location. As depicted on Figure 2, the Site is located just south of the axis of a small high-angle fault which dips to the southwest. Approximately three-quarter miles east of the Site is another small high-angle fault which dips to the northeast. The combination of these two bedrock structures beneath the Site creates a topographic slope of the bedrock layers to the west/southwest toward the syncline axis.

Stratigraphy and Hydrogeology

The consolidated geologic units that will be accessed by the Camilletti #1-10 exploration well include four main geologic formations. These formations are Cretaceous in age and, from youngest to oldest, are the Iles Formation, Mancos Formation (commonly referred to as the Mancos Shale), Niobrara Formation, and Frontier Formation.

The Iles Formation is part of the larger Mesa Verde Group and was deposited in a transgressive/regressive shoreline environment. This means as the ocean shoreline moved inland and regressed back toward the sea again, the sediment deposited would alternate between shale (deep water) and sand (shallow water). The Iles Formation is Cretaceous in age and outcrops in the area surrounding the Camilletti #1-10 well pad location. The Mesa Verde Group is estimated to be approximately 1,100 feet thick in the area of the Camilletti #1-10 exploration well. While the Mesa Verde Group generally consists of the Williams Fork and the Iles formations, the Williams Fork Formation outcrops to the west and is not present at the Site.

The Trout Creek Sandstone member of the Iles Formation is considered a regional aquifer where accessible (Barkmann, 2011). However, due to the current geometry of the southeastern corner of the Sand Wash Basin, the Trout Creek Sandstone outcrops prior to reaching the Camilletti #1-10 well pad location, which is located further to the east. As a result, the Camilletti #1-10 exploration well is not expected to make contact with this water-bearing zone of the Iles Formation. The general thickness of the Trout Creek Sandstone is one hundred feet though the thickness varies across the basin (Fenneman and Gale, 1906). While many smaller sandstone layers exist, this is the largest and represents the most significant water bearing unit in the Iles Formation. The dip of the bedrock units in this portion of the Sand Wash Basin is to the east toward the adjacent syncline axis (Figure 2). These members are generally used as a primary water source at the unconfined edge of the basin where fresh water recharges the members via the exposed outcrops. Infiltrated water migrates down dip.

It should be noted that each of these large sandstone members is directly overlain by a large coal deposit. The sandstone members are frequently used to stratigraphically divide the economically viable coal deposits between them. The coal layers represent the backbay peat deposits created by buried plant material before the shoreline moved inland and buried the peat under marine



shale (Barkmann, 2011). Because of this depositional sequence, the water quality in the sandstone members of the Mesa Verde Group may exhibit higher levels of total dissolved solids (TDS) and sodium adsorption ratio (SAR) when compared to aquifers without intercalated coal deposits. Water quality data in the Trout Creek Sandstone is fairly limited but exhibits a trend of higher quality water at the basin edge trending toward elevated TDS concentrations and slightly elevated SAR levels approaching the center of the basin (Barkmann, 2011).

The Mancos Shale is a gray marine shale that underlies the Mesa Verde Group and includes multiple members such as the Niobrara Formation. The Mancos Shale is considered marine shale and a confining unit (Barkmann, 2011). Within the Mancos Shale, the Niobrara Formation is a calcareous shale unit that is a petroleum hydrocarbon source rock. The Camilletti #1-10 exploration well will be drilled and completed into this calcareous shale layer. It is estimated that the Niobrara Formation is approximately 3,400 feet to 3,600 feet deep in the area of the Trout Creek #1-30 production pad (Figure 2).

The conclusion of the structural, stratigraphic, and hydrogeologic analysis at the Site is that an unconfined aquifer exists beneath the surface. The major confined water-bearing unit in the Sand Wash Basin (Trout Creek Sandstone) is documented as outcropping to the west prior to reaching the Site. The water available in the vicinity of the Site is in the shallow unconfined groundwater in the Browns Park Formation and surface colluvium. The flow in the unconfined groundwater in the upper reaches of the Iles Formation is dominated by local surface structure. There are no deeper, major confined water bearing units in the area.

Water quality, although based on only limited data, exhibited low TDS and SAR concentrations at the edges of the basin. As the water slowly migrates toward the center of the basin and interacts with the lithology, the quality of the water continues to degrade exhibiting increasing levels of TDS and SAR.

Camilletti #1-10 Well Construction/Completion

The Camilletti #1-10 exploration well will be drilled to a total vertical depth of approximately 5,750 feet. The well will be vertical drilled with no horizontal offset. The well casing, which is a series of metal tubes installed in the freshly drilled boring, is engineered to strengthen the outer wall of the well bore and isolate the production stream pumped from hydrocarbon-producing and brackish water zones from the near surface unconfined and deeper confined water-bearing zones. The casing also prevents other fluids/gases from seeping into the subsurface through the wellbore during drilling and completion activities and ensures that no oil or gas escapes from the well as product is brought to the surface. Surface casing will be set and cemented in place down to 1,200 feet, 100 feet below the bottom of the Iles Formation. Intermediate casing will be set and cemented in place down to a depth of approximately 3,320 feet and sealed. Production tubing will be installed down to the total depth of the well (5,750 feet). The base of the intermediate casing will be set below the top of the Niobrara formation below any of the fresh water aquifers identified in the unconsolidated Rabbit Ears Loam, the Mesa Verde Group, which includes the main regional water sources in the Iles formations, and the Mancos Formation.



There are no identified exploitable water sources below 3,320 feet. Below the sealed intermediate casing the production tubing within the boring will not be cased which will provide operational flexibility while the exploration well is being drilled and developed.

As described above, there is one permitted water well in the DWR database within one-half mile of the Site. DWR permitted water well #111586 is approximately 240 feet deep. There are eight permitted water wells between one-half mile and one mile in the area north of U.S. Highway 40 and up-gradient of the town of Milner. Two water wells (DWR permit #57623 and #57625) are completed at 20 feet and 60 feet, respectively and appear to be completed in the Rabbit Ears Colluvium. Four of the water wells (DWR permits #126149, #265231, #268335 and #162750) appear to access water in the Iles Formation and are completed at depths ranging from 115 feet to 340 feet. Completion data for three of the water wells (DWR permits #46361, #57624 and #111586) were not available. DWR permitted water well #162750 is completed at 340 feet below ground surface. There are no other permitted water wells within one mile of the Site completed deeper than 340 feet.

After completion of the surface casing and the intermediate casing, SEPCO will have protected all usable water bearing units, including the unconfined waters in the upper reaches of the Rabbit Ears Colluvium and confined aquifers in the Iles Formation to a depth of 3,320 feet below ground surface with steel casing before the final phase of drilling and completion activities are initiated. Once the Camilletti #1-10 exploration well is completed and the production tubing is installed. The base of the intermediate casing will be set at the top of the Niobrara formation below any of the fresh water aquifers identified in the unconsolidated Rabbit Ears Loam, the Mesa Verde Group, which includes the main regional water sources in the Iles formation, and the unnamed aquifers in the Mancos Formation. There are no identified exploitable water sources below 3,320 feet. Below the sealed intermediate casing the production tubing within the boring will not be cased which will provide operational flexibility while the exploration well is being drilled and developed. Figure 3 depicts the depth of the installed surface, intermediate, and production casing, and the total vertical depth of the production well in relation to the estimated subsurface stratigraphy.

Well Information Review / Proposed Water Well Sample Locations

After a review of the DWR records, SEPCO has identified eight permitted water wells down-gradient of the Site between the town of Milner and the proposed Camilletti #1-10 exploration well along with one permitted water well and one spring located up-gradient or cross-gradient of the Site, as depicted on Figure 4 and summarized in Table 1. All of the water wells are completed above the planned bottom of the surface and intermediate casing for Camilletti #1-10 exploration well.

In order to be protective of the water wells in the town of Milner, SEPCO has directed LTE to investigate the permitted water well between one-half and one mile of the Site, which encompasses all the water wells in the town of Milner. The location of the water wells are plotted



and highlighted on Figure 4. Information pertaining to all permitted water wells within a 1-mile radius of the Site has been summarized in Table 1 with the wells to be sampled highlighted.

SEPCO intends to seek access to collect baseline water samples from the unnamed seep/spring and permitted water well #111586 both located within one-half mile of the Camilletti #1-10, in addition to permitted water wells #46361, #57623, #57624, #57625, #162750, #265231, #268335 and #126149 located up-gradient of Milner in the zone north of U.S. Highway 40 between one-half mile and one mile of the Camilletti #1-10. These water wells will be monitored for changes in water quality that could be attributable to a release from the Camilletti #1-10 exploration well. They were selected because their locations will allow changes in water quality to be identified and evaluated before similar impacts reach the water wells in Milner. SEPCO personnel will attempt to secure access from the owner(s) of the existing water wells and seep listed above. The water wells proposed for sampling are highlighted on Table 1.

Task 2 Sample Collection

Baseline water sampling of the permitted water wells will be completed prior to drilling of the Camilletti #1-10 exploration well, in accordance with the COGA Program.

LTE has prepared a Sampling and Analysis Plan (SAP) to meet the SEPCO Program which addresses the requirements of the COGCC Rule 609 baseline sampling COA and includes the additional monitoring parameters selected by SEPCO. A copy of the SAP will be submitted to Routt County for review upon request.

LTE field staff will visit the sampling location, collect water samples from the water wells, and will measure field water quality parameters at the time of collection. The location of the water wells will be identified by using a global positioning system (GPS) unit. LTE will record the installation date, well depths, unusual odors/color, and/or other pertinent information.

During the water well purging process, LTE will record field measurements of pH, temperature, and conductivity at five minute intervals. The water wells will be purged until the pH, temperature, and conductivity have stabilized, indicating formation water is being extracted. Once the purging is complete, LTE will collect the water samples in laboratory-provided bottles.

The LTE field scientist will note odor, water color, and effervescence during the sampling process. In accordance with COGCC Rule 609, each water sample will be field screened for conductivity, temperature, and pH along with the sample analytical suite listed in Rule 609. Note that the analyte suite for the initial samples and the subsequent samples vary slightly in accordance with Rule 609. The sample analyses and analytical methods are summarized in Table 2.

An additional 1-liter plastic sample bottle preserved with benzalkonium chloride will be filled at the time of sampling for each water well and held by LTE, pending the results of the dissolved methane analysis, for analysis of Fixed Gases C1-C6 by U.S. Environmental Protection Agency



(EPA) Method RSK175 and Stable Isotopic Concentration of the Carbon and Hydrogen in Methane by EPA Method NG-1.

Task 3 Sample Analysis

Water samples will be submitted under strict chain-of-custody documentation to ACZ Laboratories (ACZ) in Steamboat Springs, Colorado. ACZ is a National Environmental Laboratory Accreditation Program (NELAP)-accredited laboratory. If dissolved methane is detected above 1.0 milligrams per liter (mg/L), LTE will submit the additional sample bottle(s) to Isotech Laboratory (Isotech) in Champaign, Illinois, for analysis of gas composition and analysis of the carbon and hydrogen isotope ratios of methane. Compositional/isotopic analysis is not addressed under NELAP accreditation.

Task 4 Data Evaluation and Report Preparation

Following receipt of all laboratory data, LTE will prepare a brief report for SEPCO that will include the following:

- A summary of the water quality data for the water wells sampled;
- The locations of the water wells sampled illustrated on an area map;
- Photographs of the water well locations; and
- Description and documentation of the field sampling methods and laboratory analytical methods utilized.

The report will be submitted to Routt County within 14 days of receipt of sample results. Drilling of the proposed Camilletti #1-10 exploration well will commence after Routt County has received the initial report. Upon receipt of the sampling program analytical results from the laboratory(ies), LTE will upload the data to the COGCC online database.

Monitoring After Completion of Oil Well at Proposed Location

In accordance with the SEPCO program for the SEPCO production wells in Routt County, sampling and testing of permitted water wells will be conducted annually. This monitoring frequency exceeds that required by COGCC Rule 609. A final sampling round will be performed one year after the Camilletti #1-10 exploration well has been plugged and abandoned. If the sampling indicates no impact to the groundwater from oil and gas activities, monitoring of the permitted water wells will be discontinued.

If the water sample testing of the permitted water wells conducted after the proposed Camilletti #1-10 exploration well has been drilled indicates abnormalities (determined upon a comparison with established baseline levels) or petroleum hydrocarbon-related impact, SEPCO will notify Routt County and the COGCC and immediately implement an investigation to identify the source of the water quality impacts.



References

Barkmann, Peter E., 2011, Coalbed Methane Stream Depletion Study, Sand Wash Basin, Colorado. Colorado Geological Survey - Department of Natural Resources.

Boggs, Jr., Sam, 2001, Principles of Sedimentology and Stratigraphy. University of Oregon.

Fenneman and Gale, 1906, The Yampa Coal Field, Routt County, Colorado. United States Department of the Interior Geological Survey.

Honey, James G. and Glen A. Izett, 1988, Paleontology, Taphonomy, and Stratigraphy of the Browns Park Formation (Oligocene and Miocene) Near Maybell, Moffatt County, Colorado. United States Department of the Interior Geological Survey.

USDA Web Soil <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>

Tweto, Ogden, 1976, Geologic Map of the Craig 1 degree x 2 degrees Quadrangle, Northwestern Colorado Map, USGS Map I-972. United States Geologic Survey.



FIGURES

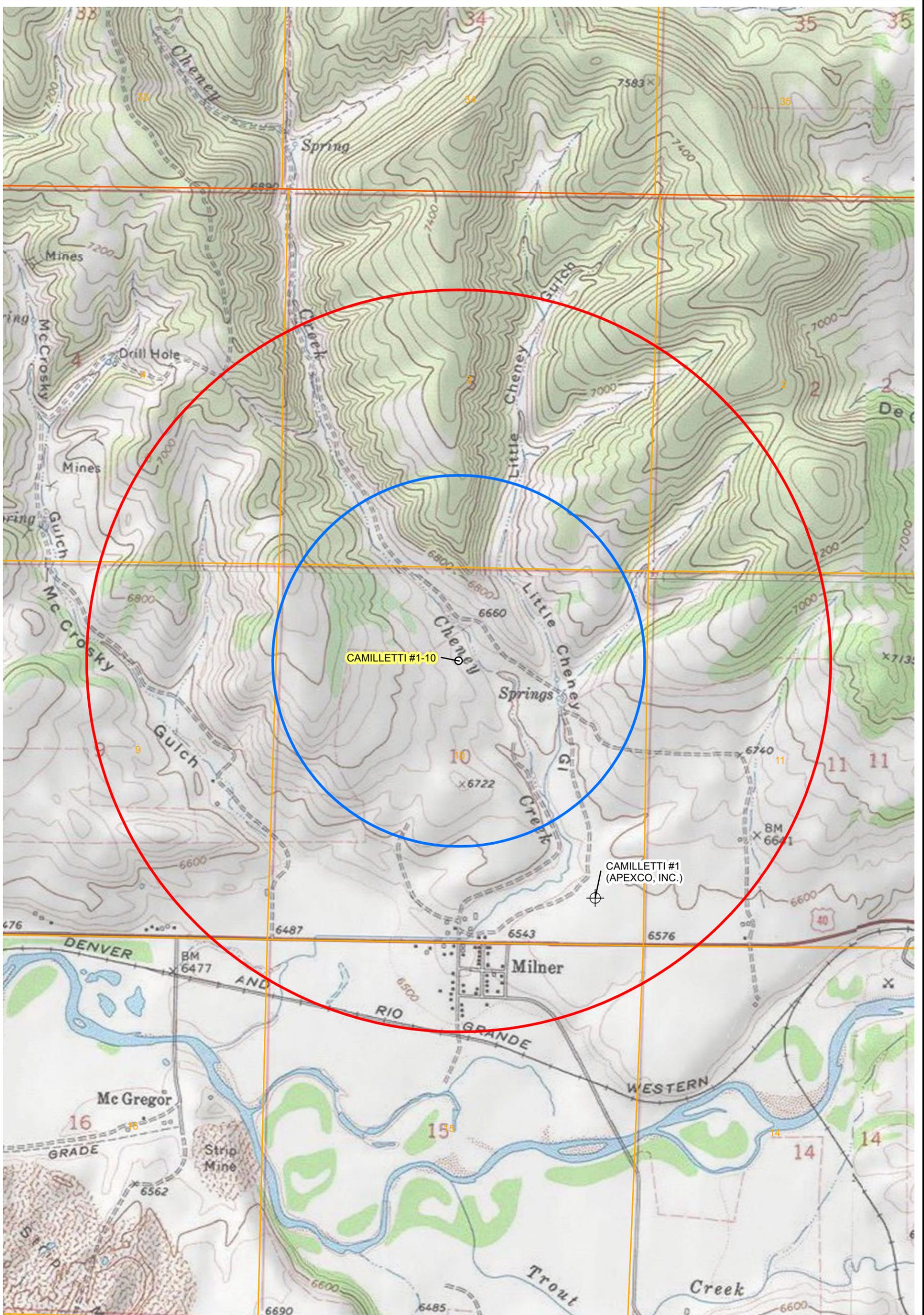


IMAGE COURTESY OF ESRI/USGS

LEGEND

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| OIL/GAS WELL STATUS |  TOWNSHIP AND RANGE |
|  SECTION | |
|  PLUGGED AND ABANDONED | |
|  PERMIT LOCATION | |
|  HALF-MILE BUFFER | |
|  ONE-MILE BUFFER | |

YELLOW HIGHLIGHT INDICATES SWEPI LP WELL



FIGURE 1
NEARBY OIL/GAS PRODUCTION WELLS
CAMILLETTI #1-10
BASELINE GROUNDWATER MONITORING
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY



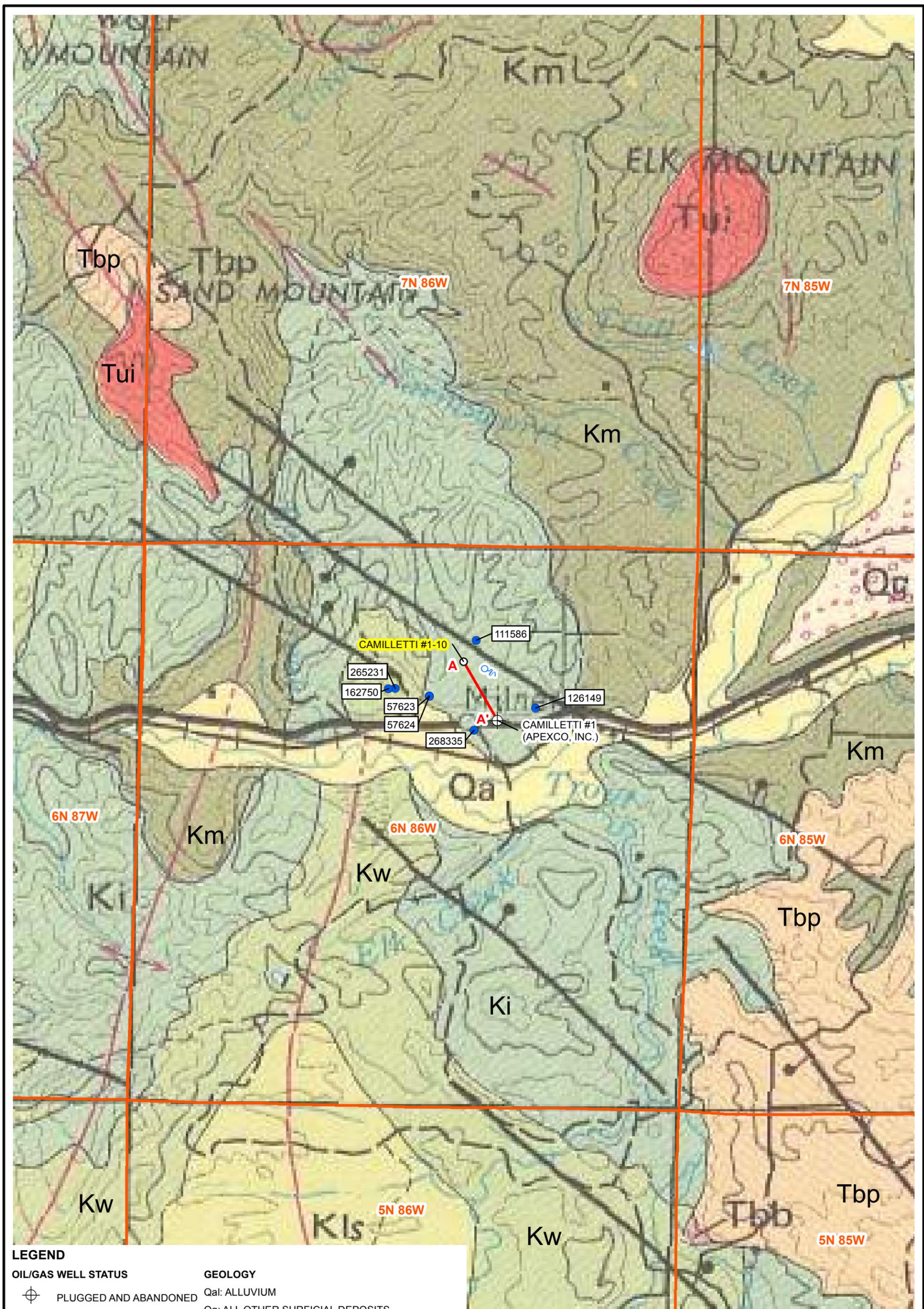


IMAGE COURTESY OF USGS, MAP I-972

LEGEND

OIL/GAS WELL STATUS

- PLUGGED AND ABANDONED
- PERMIT LOCATION
- CROSS SECTION A-A'
- TOWNSHIP AND RANGE

GEOLOGY

- Qa: ALLUVIUM
- Qg: ALL OTHER SURFICIAL DEPOSITS
- Tbp: BROWNS PARK FORMATION
- Tbb: BASALT OF BIMODAL VOLCANIC SUITE
- Tui: UPPER TERTIARY INTRUSIVE ROCKS
- Kls: LEWIS SHALE
- Ki: ILES FORMATION
- Kw: WILLIAMS FORK FORMATION
- Km: MANCOS FORMATION

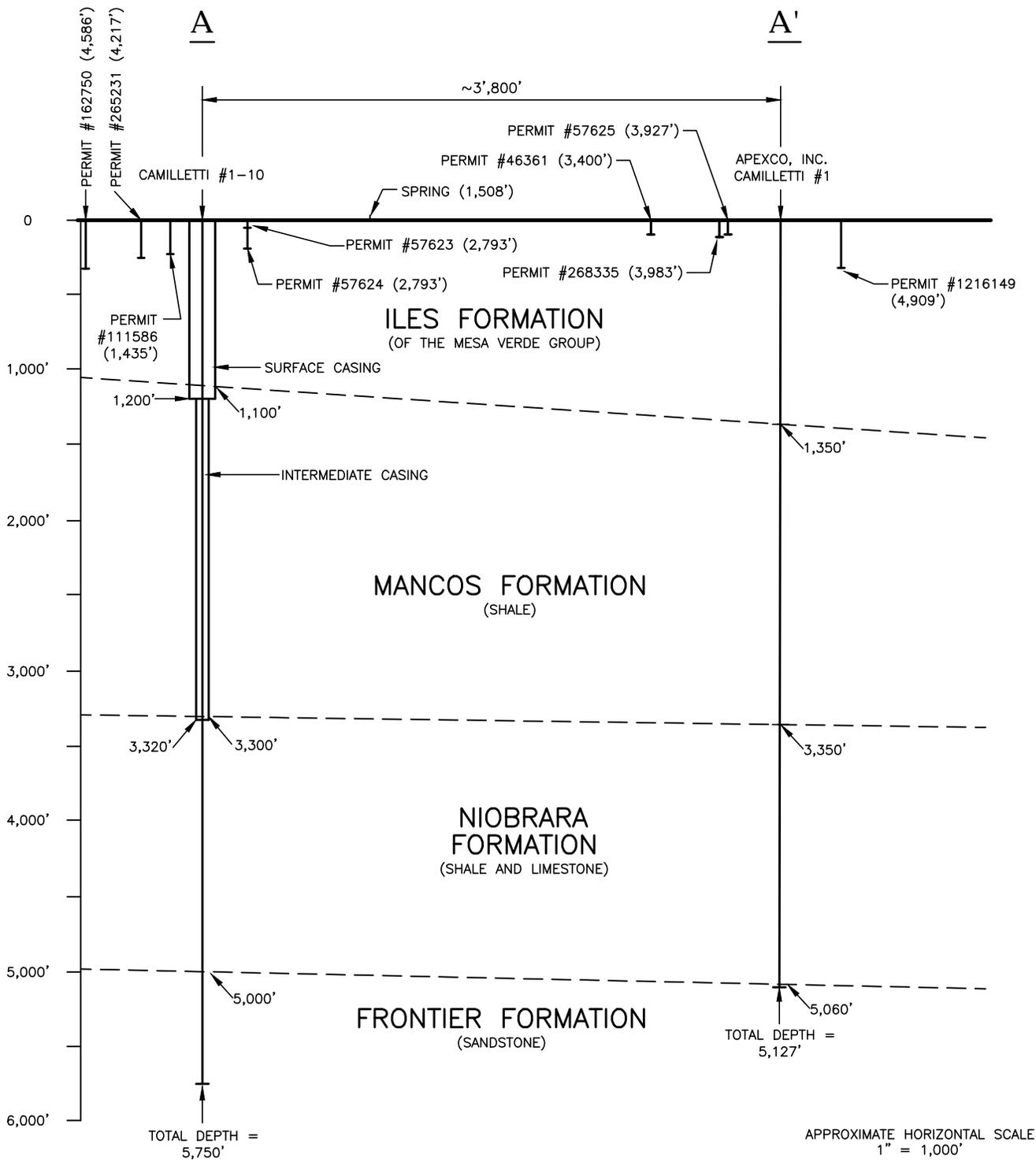
YELLOW HIGHLIGHT INDICATES SWEPI LP WELL



**FIGURE 2
GEOLOGIC MAP
CAMILLETTI #1-10
BASELINE GROUNDWATER MONITORING
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY**



FEET BELOW GROUND SURFACE



NOTE:
 1. ALL FORMATION DEPTHS ARE APPROXIMATE BASED ON NEAREST WELL INFORMATION
 2. PERMITTED WATER WELLS LOCATIONS ARE PROJECTED INTO THE SECTION LINE. THE ACTUAL DISTANCES OF THE PERMITTED WATER WELLS FROM THE CAMILLETTI #1-10 ARE LISTED ABOVE.

FIGURE 3
SCHEMATIC STRATIGRAPHIC CROSS SECTION A-A'
CAMILLETTI #1-10
SWAN PROJECT
2013 BASELINE GROUNDWATER MONITORING
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY



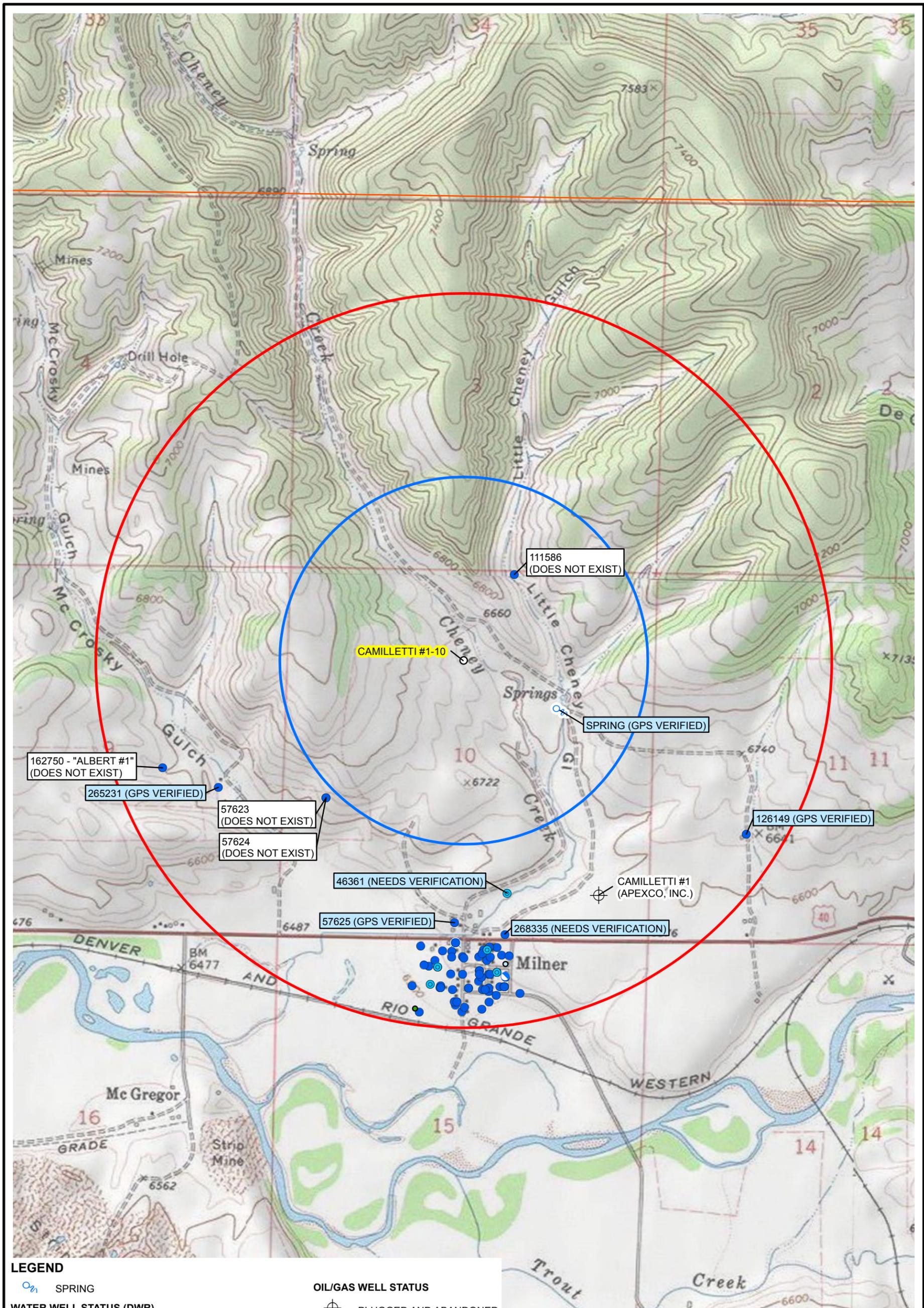


IMAGE COURTESY OF ESRI/USGS

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- | | |
|---|--|
| <ul style="list-style-type: none"> SPRING WATER WELL STATUS (DWR) UNKNOWN APPLICATION WITHDRAWN PERMIT EXPIRED PERMIT ISSUED; COMPLETION STATUS UNKNOWN WELL ABANDONED WELL CONSTRUCTED | <ul style="list-style-type: none"> OIL/GAS WELL STATUS PLUGGED AND ABANDONED PERMIT LOCATION HALF-MILE BUFFER ONE-MILE BUFFER TOWNSHIP AND RANGE |
|---|--|

**YELLOW HIGHLIGHT INDICATES SWEPI LP WELL,
WELL OR SEEP/SPRING TO BE SAMPLED**



**FIGURE 4
NEARBY SPRING/WATER WELLS
CAMILLETTI #1-10
BASELINE GROUNDWATER MONITORING
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY**



TABLES

TABLE 1
BASELINE GROUNDWATER MONITORING PROGRAM
PERMITTED WATER WELL LOCATIONS
CAMILLETTI #1-10
SWAN PROJECT
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM ¹	TWSP ²	RNG ³	SEC ⁴
57623	DOMESTIC	WELL CONSTRUCTED	20	YES	CAMILLETTI #1-10	2793	SW	DOWNGRADIENT	6	6 N	86 W	10
57624	DOMESTIC	WELL CONSTRUCTED	0	YES	CAMILLETTI #1-10	2793	SW	DOWNGRADIENT	6	6 N	86 W	10
57625	DOMESTIC	WELL CONSTRUCTED	64	YES	CAMILLETTI #1-10	3927	S-SE	DOWNGRADIENT	6	6 N	86 W	10
111586	DOMESTIC	WELL CONSTRUCTED	240	YES	CAMILLETTI #1-10	1436	NE	UP- CROSSGRADIENT	6	6 N	86 W	10
126149	DOMESTIC	WELL CONSTRUCTED	332	YES	CAMILLETTI #1-10	4909	SE	DOWN- CROSS GRADIENT	6	6 N	86 W	11
162750	DOMESTIC	WELL CONSTRUCTED	340	YES	CAMILLETTI #1-10	4587	W-SW	DOWNGRADIENT	6	6 N	86 W	9
265231	DOMESTIC	WELL CONSTRUCTED	260	YES	CAMILLETTI #1-10	4217	W-SW	DOWNGRADIENT	6	6 N	86 W	9
268335	DOMESTIC	WELL CONSTRUCTED PERMIT ISSUED; COMPLETION STATUS UNKNOWN	115	YES	CAMILLETTI #1-10	3983		DOWNGRADIENT	6	6 N	86 W	10
46361*	OTHER	UNKNOWN	0	YES	CAMILLETTI #1-10	3400	S-SE	DOWNGRADIENT	6	6 N	86 W	10
SPRING 0	N/A DOMESTIC	SPRING APPLICATION WITHDRAWN WELL	0	YES NO	CAMILLETTI #1-10 CAMILLETTI #1-10	1821 5053	E-SE S	CROSS GRADIENT DOWNGRADIENT	6 6	6 N 6 N	86 W 86 W	10 15
2557	DOMESTIC	WELL CONSTRUCTED	75	NO	CAMILLETTI #1-10	4727	S	DOWNGRADIENT	6	6 N	86 W	15
13627	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4734	S	DOWNGRADIENT	6	6 N	86 W	15
15103	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4727	S	DOWNGRADIENT	6	6 N	86 W	15



TABLE 1

**BASELINE GROUNDWATER MONITORING PROGRAM
 PERMITTED WATER WELL LOCATIONS
 CAMILLETTI #1-10
 SWAN PROJECT
 ROUTT COUNTY, COLORADO
 SHELL EXPLORATION AND PRODUCTION COMPANY**

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM¹	TWSP²	RNG³	SEC⁴
19221	COMMERCIAL	WELL CONSTRUCTED	44	NO	CAMILLETTI #1-10	4420	S	DOWNGRADIENT	6	6 N	86 W	15
19221	DOMESTIC	WELL CONSTRUCTED	52	NO	CAMILLETTI #1-10	4420	S	DOWNGRADIENT	6	6 N	86 W	15
36225	DOMESTIC	WELL CONSTRUCTED	70	NO	CAMILLETTI #1-10	4509	S	DOWNGRADIENT	6	6 N	86 W	15
49743	DOMESTIC	WELL CONSTRUCTED	0	NO	CAMILLETTI #1-10	4525	S	DOWNGRADIENT	6	6 N	86 W	15
49819	DOMESTIC	WELL CONSTRUCTED	60	NO	CAMILLETTI #1-10	4592	S	DOWNGRADIENT	6	6 N	86 W	15
49819	DOMESTIC	WELL ABANDONED	41	NO	CAMILLETTI #1-10	4592	S	DOWNGRADIENT	6	6 N	86 W	15
50656	DOMESTIC	WELL CONSTRUCTED	30	NO	CAMILLETTI #1-10	4152	S	DOWNGRADIENT	6	6 N	86 W	15
57605	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4727	S	DOWNGRADIENT	6	6 N	86 W	15
57606	DOMESTIC	WELL CONSTRUCTED	54	NO	CAMILLETTI #1-10	4727	S	DOWNGRADIENT	6	6 N	86 W	15
76168	DOMESTIC	WELL CONSTRUCTED	40	NO	CAMILLETTI #1-10	4908	S	DOWNGRADIENT	6	6 N	86 W	15
76168	DOMESTIC	WELL CONSTRUCTED	40	NO	CAMILLETTI #1-10	4908	S	DOWNGRADIENT	6	6 N	86 W	15
82098	DOMESTIC	WELL CONSTRUCTED	38	NO	CAMILLETTI #1-10	4983	S	DOWNGRADIENT	6	6 N	86 W	15
88452	DOMESTIC	WELL CONSTRUCTED	42	NO	CAMILLETTI #1-10	4733	S	DOWNGRADIENT	6	6 N	86 W	15
88574	DOMESTIC	WELL CONSTRUCTED	54	NO	CAMILLETTI #1-10	4279	S	DOWNGRADIENT	6	6 N	86 W	15
89085	DOMESTIC	WELL CONSTRUCTED	60	NO	CAMILLETTI #1-10	4265	S	DOWNGRADIENT	6	6 N	86 W	15
91064	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4419	S	DOWNGRADIENT	6	6 N	86 W	15



TABLE 1
BASELINE GROUNDWATER MONITORING PROGRAM
PERMITTED WATER WELL LOCATIONS
CAMILLETTI #1-10
SWAN PROJECT
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM¹	TWSP²	RNG³	SEC⁴
93485	DOMESTIC	WELL CONSTRUCTED	72	NO	CAMILLETTI #1-10	4742	S	DOWNGRAIENT	6	6 N	86 W	15
94383	DOMESTIC	PERMIT EXPIRED WELL	0	NO	CAMILLETTI #1-10	4058	S	DOWNGRAIENT	6	6 N	86 W	15
94383	DOMESTIC	CONSTRUCTED WELL	38	NO	CAMILLETTI #1-10	4058	S	DOWNGRAIENT	6	6 N	86 W	15
94384	DOMESTIC	CONSTRUCTED WELL	38	NO	CAMILLETTI #1-10	4708	S	DOWNGRAIENT	6	6 N	86 W	15
94384	DOMESTIC	CONSTRUCTED WELL	55	NO	CAMILLETTI #1-10	4708	S	DOWNGRAIENT	6	6 N	86 W	15
94970	DOMESTIC	CONSTRUCTED WELL	15	NO	CAMILLETTI #1-10	4465	S	DOWNGRAIENT	6	6 N	86 W	15
94970	DOMESTIC	CONSTRUCTED WELL	55	NO	CAMILLETTI #1-10	4465	S	DOWNGRAIENT	6	6 N	86 W	15
103128	DOMESTIC	CONSTRUCTED WELL	54	NO	CAMILLETTI #1-10	4218	S	DOWNGRAIENT	6	6 N	86 W	15
105087	DOMESTIC	CONSTRUCTED WELL	50	NO	CAMILLETTI #1-10	4716	S	DOWNGRAIENT	6	6 N	86 W	15
105875	DOMESTIC	CONSTRUCTED WELL	70	NO	CAMILLETTI #1-10	4716	S	DOWNGRAIENT	6	6 N	86 W	15
109734	DOMESTIC	CONSTRUCTED WELL	36	NO	CAMILLETTI #1-10	4769	S	DOWNGRAIENT	6	6 N	86 W	15
109736	DOMESTIC	CONSTRUCTED WELL	70	NO	CAMILLETTI #1-10	4720	S	DOWNGRAIENT	6	6 N	86 W	15
129433	DOMESTIC	CONSTRUCTED WELL	41	NO	CAMILLETTI #1-10	4557	S	DOWNGRAIENT	6	6 N	86 W	15
134992	DOMESTIC	CONSTRUCTED WELL	40	NO	CAMILLETTI #1-10	4332	S	DOWNGRAIENT	6	6 N	86 W	15
145281	DOMESTIC	CONSTRUCTED WELL	61	NO	CAMILLETTI #1-10	4527	S	DOWNGRAIENT	6	6 N	86 W	15
149452	DOMESTIC	CONSTRUCTED WELL	50	NO	CAMILLETTI #1-10	4185	S	DOWNGRAIENT	6	6 N	86 W	15



TABLE 1
BASELINE GROUNDWATER MONITORING PROGRAM
PERMITTED WATER WELL LOCATIONS
CAMILLETTI #1-10
SWAN PROJECT
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM¹	TWSP²	RNG³	SEC⁴
151370	DOMESTIC	WELL CONSTRUCTED	45	NO	CAMILLETTI #1-10	4171	S	DOWNGRADIENT	6	6 N	86 W	15
161501	DOMESTIC	WELL CONSTRUCTED	58	NO	CAMILLETTI #1-10	4854	S	DOWNGRADIENT	6	6 N	86 W	15
162188	DOMESTIC	WELL CONSTRUCTED	60	NO	CAMILLETTI #1-10	4614	S	DOWNGRADIENT	6	6 N	86 W	15
166566	DOMESTIC	WELL CONSTRUCTED	57	NO	CAMILLETTI #1-10	4686	S	DOWNGRADIENT	6	6 N	86 W	15
175393	DOMESTIC	WELL CONSTRUCTED	0	NO	CAMILLETTI #1-10	4738	S	DOWNGRADIENT	6	6 N	86 W	15
175393	DOMESTIC	WELL CONSTRUCTED	72	NO	CAMILLETTI #1-10	4738	S	DOWNGRADIENT	6	6 N	86 W	15
176544	DOMESTIC	WELL CONSTRUCTED	74	NO	CAMILLETTI #1-10	5091	S	DOWNGRADIENT	6	6 N	86 W	15
177036	DOMESTIC	WELL CONSTRUCTED	70	NO	CAMILLETTI #1-10	4957	S	DOWNGRADIENT	6	6 N	86 W	15
204333	DOMESTIC	WELL CONSTRUCTED	90	NO	CAMILLETTI #1-10	4835	S	DOWNGRADIENT	6	6 N	86 W	15
224645	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	5017	S	DOWNGRADIENT	6	6 N	86 W	15
228005	DOMESTIC	WELL CONSTRUCTED	60	NO	CAMILLETTI #1-10	4183	S	DOWNGRADIENT	6	6 N	86 W	15
236160	DOMESTIC	WELL CONSTRUCTED	57	NO	CAMILLETTI #1-10	4324	S	DOWNGRADIENT	6	6 N	86 W	15
236187	DOMESTIC	WELL CONSTRUCTED	58	NO	CAMILLETTI #1-10	4507	S	DOWNGRADIENT	6	6 N	86 W	15
243526	DOMESTIC	WELL CONSTRUCTED	72	NO	CAMILLETTI #1-10	4924	S	DOWNGRADIENT	6	6 N	86 W	15
268321	DOMESTIC	WELL CONSTRUCTED	40	NO	CAMILLETTI #1-10	4715	S	DOWNGRADIENT	6	6 N	86 W	15
270699	DOMESTIC	WELL CONSTRUCTED	59	NO	CAMILLETTI #1-10	4266	S	DOWNGRADIENT	6	6 N	86 W	15



TABLE 1
BASELINE GROUNDWATER MONITORING PROGRAM
PERMITTED WATER WELL LOCATIONS
CAMILLETTI #1-10
SWAN PROJECT
ROUTT COUNTY, COLORADO
SHELL EXPLORATION AND PRODUCTION COMPANY

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM¹	TWSP²	RNG³	SEC⁴
270700	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4135	S	DOWNGRAIENT	6	6 N	86 W	15
270701	DOMESTIC	WELL CONSTRUCTED	49	NO	CAMILLETTI #1-10	4255	S	DOWNGRAIENT	6	6 N	86 W	15
270701	DOMESTIC	WELL CONSTRUCTED	58	NO	CAMILLETTI #1-10	4255	S	DOWNGRAIENT	6	6 N	86 W	15
270702	DOMESTIC	WELL CONSTRUCTED	55	NO	CAMILLETTI #1-10	4511	S	DOWNGRAIENT	6	6 N	86 W	15
273504	DOMESTIC	WELL CONSTRUCTED	20	NO	CAMILLETTI #1-10	4152	S	DOWNGRAIENT	6	6 N	86 W	15
273505	DOMESTIC	WELL CONSTRUCTED	39	NO	CAMILLETTI #1-10	4295	S	DOWNGRAIENT	6	6 N	86 W	15
273506	DOMESTIC	WELL CONSTRUCTED	41	NO	CAMILLETTI #1-10	4270	S	DOWNGRAIENT	6	6 N	86 W	15
275674	DOMESTIC	WELL CONSTRUCTED	59	NO	CAMILLETTI #1-10	5050	S	DOWNGRAIENT	6	6 N	86 W	15
277964	DOMESTIC	WELL ABANDONED	0	NO	CAMILLETTI #1-10	4465	S	DOWNGRAIENT	6	6 N	86 W	15
277964	DOMESTIC	WELL CONSTRUCTED	50	NO	CAMILLETTI #1-10	4465	S	DOWNGRAIENT	6	6 N	86 W	15
183213*	DOMESTIC	PERMIT ISSUED; COMPLETION STATUS UNKNOWN	0	NO	CAMILLETTI #1-10	4508	S	DOWNGRAIENT	6	6 N	86 W	15
187524*	DOMESTIC	PERMIT ISSUED; COMPLETION STATUS UNKNOWN	0	NO	CAMILLETTI #1-10	4405	S	DOWNGRAIENT	6	6 N	86 W	15
201943*	OTHER	UNKNOWN	0	NO	CAMILLETTI #1-10	4677	S	DOWNGRAIENT	6	6 N	86 W	15



TABLE 1

BASELINE GROUNDWATER MONITORING PROGRAM
 PERMITTED WATER WELL LOCATIONS
 CAMILLETTI #1-10
 SWAN PROJECT
 ROUTT COUNTY, COLORADO
 SHELL EXPLORATION AND PRODUCTION COMPANY

WATER WELL PERMIT NUMBER	WELL USE	WELL STATUS	WELL DEPTH (ft)	PROPOSED TO BE SAMPLED	ASSOCIATED SEPCO SITE	APPROXIMATE DISATANCE FROM CAMILLETTI #1-10 (ft)	DIRECTION FROM FROM CAMILLETTI #1-10	PRESUMED SURFACE GRADIENT	PM ¹	TWSP ²	RNG ³	SEC ⁴
247158*	COMMERCIAL	PERMIT ISSUED; COMPLETION STATUS UNKNOWN	0	NO	CAMILLETTI #1-10	4174	S	DOWNGRADIANT	6	6 N	86 W	15
273795*	DOMESTIC	PERMIT ISSUED; COMPLETION STATUS UNKNOWN	0	NO	CAMILLETTI #1-10	4419	S	DOWNGRADIANT	6	6 N	86 W	15

Notes:

¹ PM - Prime Meridian

² TWSP - Township

³ RNG - Range

⁴ SEC - Section

* Although these wells have been permitted they do not appear to have been drilled

N - North

S - South

E - East

W - West

NW - Northwest

SW - Southwest

NE - Northeast

SE - Southeast



TABLE 2
BASELINE GROUNDWATER MONITORING SUMMARY
CAMILLETTI #1-10
SWAN PROJECT
ROUTT COUNTY, COLORADO

SHELL EXPLORATION AND PRODUCTION COMPANY

Analyte	Container and Preservative	Laboratory Method(s)	Holding Time (days)
pH	Plastic, 4°C	SM4500-H+, EPA 150.1 or SW-846 9040C	As soon as practicable
Specific Conductance		SM-2510 SW-846 9050A	28 days
Total Dissolved Solids*		SM-2540C	7 days
Dissolved Gases	Glass 40ml VOA vial may be preserved with HCl to pH <2	RSK-175(mod)	Not established, but 14 days assumed
Alkalinity*	Plastic, 4°C	SM2320B	14
Major Anions Br, Cl, F, SO4* NO3 and NO2 (individually)	Plastic, 4°C	EPA 300.0, SW-846 9056	28 nitrite 48 hours
Nitrate/Nitrite	Plastic 4°C and H2SO4 if analysis not within 24 hours	353.3	28 days
Phosphorous	Plastic	SM-4500-P 365.3	
Dissolved Major Cations Ca, Fe, Mg, Mn, K, Na*	Plastic (0.45µm filtered in field and acidified to pH<2 with HNO3) or shipped unfiltered at ambient pH in plastic container and filtered and acidified on receipt at laboratory	200.7/200.8 SW-846 6010C/6020A	180
Other Elements Ba, B, Se, Sr			
TPH (extractable) C10-C26 range	Amber glass, 4°C	SW-846 8015C and modifications	7
TPH (volatile) (2-methylpentane to 1,2,4-trimethylbenzene range*	Glass 40ml VOA vial, pH <2 with HCl or as per CDPHE guidance	SW-846 8015C and modifications	14
benzene, toluene, ethylbenzene, o-xylene, m+p-xylenes, and total xylenes*		SW-846 8260B SW-846 8260C	14
Bacterial Activity Reaction Tests	Sterile plastic	BART documentation	As soon as practicable
Gas Composition and Isotopic Ratio Analyses	1 liter poly bottle with septa cap 4°C, bactericide (benzalkonium chloride)	Laboratory Specific SOPs	Not established but 28 days assumed

Samples for all listed analytes will be collected during the initial baseline sampling. Subsequent samples will only be submitted for the analyses denoted with "*".

