

**BOUVIER EMERGENCY RESPONSE INVESTIGATION  
LAS ANIMAS COUNTY, COLORADO**

**JUNE 2007**

**Prepared for:**

**COLORADO OIL AND GAS CONSERVATION COMMISSION  
Denver, Colorado**



**BOUVIER EMERGENCY RESPONSE INVESTIGATION  
LAS ANIMAS COUNTY, COLORADO**

**JUNE 2007**

**Prepared for:**

**COLORADO OIL AND GAS CONSERVATION COMMISSION  
1120 Lincoln Street, Suite 801  
Denver, Colorado 80203**

**Prepared by:**

**LT ENVIRONMENTAL, INC.  
4600 West 60<sup>th</sup> Avenue  
Arvada, Colorado 80003  
(303) 433-9788**



# TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY .....	iii
SECTION 1.0 INTRODUCTION .....	1-1
1.1 SITE DESCRIPTION .....	1-1
1.2 PURPOSE AND SCOPE .....	1-2
1.3 PROJECT BACKGROUND .....	1-3
1.4 REPORT ORGANIZATION .....	1-3
SECTION 2.0 SOIL GAS SURVEYS .....	2-1
2.1 METHODOLOGY .....	2-1
2.2 INITIAL BOUVIER RESIDENCE SURVEY RESULTS .....	2-1
2.3 ABANDONED WELLS SURVEY RESULTS .....	2-2
2.4 MINE CORE HOLE SURVEY RESULTS .....	2-2
2.5 FOLLOW-UP BOUVIER RESIDENCE SURVEY RESULTS .....	2-3
SECTION 3.0 SOIL GAS SAMPLING .....	3-1
3.1 SAMPLING METHODOLOGY .....	3-1
3.2 ANALYTICAL RESULTS .....	3-1
3.3 DATA COMPARISON .....	3-2
SECTION 4.0 WATER WELL INVESTIGATION .....	4-1
4.1 PURPOSE AND METHODOLOGY .....	4-1
4.2 INVESTIGATION RESULTS .....	4-3
4.2.1 Well Construction Information .....	4-3
4.2.2 Well Inspection .....	4-4
4.2.3 Groundwater Analytical Results .....	4-4
SECTION 5.0 INSPECTION OF NEARBY STRUCTURES .....	5-1
SECTION 6.0 GEOLOGIC RECONNAISSANCE .....	6-1
6.1 REGIONAL GEOLOGY .....	6-1
6.2 LOCAL GEOLOGY .....	6-1
SECTION 7.0 METHANE DETECTION SYSTEM INSTALLATION .....	7-1
SECTION 8.0 EXCAVATION .....	8-1



## TABLE OF CONTENTS (CONTINUED)

	<b><u>Page</u></b>
8.1 PURPOSE.....	8-1
8.2 EXCAVATION RESULTS.....	8-1
SECTION 9.0 SUMMARY.....	9-1

### **TABLES**

TABLE 1	GROUNDWATER ANALYTICAL RESULTS – ORGANICS
TABLE 2	GROUNDWATER ANALYTICAL RESULTS - INORGANICS

### **FIGURES**

FIGURE 1	SITE LOCATION MAP
FIGURE 2	SITE MAP
FIGURE 3	INITIAL SOIL GAS SURVEY RESULTS
FIGURE 4	FOLLOW-UP SOIL GAS SURVEY RESULTS
FIGURE 5	HORIZONTAL EXTENT OF METHANE SEEPAGE
FIGURE 6	WATER WELL LOCATION MAP
FIGURE 7	NEAR SURFACE SCHEMATIC GEOLOGIC CROSS-SECTION

### **APPENDICES**

APPENDIX A	SOIL GAS SURVEY EQUIPMENT SPECIFICATIONS
APPENDIX B	GAS SEEP SAMPLE LABORATORY ANALYTICAL REPORT
APPENDIX C	PRODUCED WATER GAS SAMPLE LABORATORY ANALYTICAL REPORT
APPENDIX D	COAL BED METHANE DESORPTION DATA – TRINIDAD MGP WELLS
APPENDIX E	WATER WELL CONSTRUCTION AND TEST REPORT
APPENDIX F	GROUNDWATER ANALYTICAL REPORT
APPENDIX G	METHANE DETECTION SYSTEM EQUIPMENT SPECIFICATIONS

## EXECUTIVE SUMMARY

This report, completed by LT Environmental, Inc. (LTE) for the Colorado Oil and Gas Conservation Commission (COGCC), is a summary of the emergency response investigation recently completed at the Bouvier House Explosion site in Las Animas County, Colorado.

### PURPOSE AND SCOPE

The purpose of the investigation was to identify the source of methane that was suspected of causing the explosion at the Bouvier residence and gather information that will assist in the development of mitigation and remediation strategies. The scope of work included:

- Soil gas surveys at the Bouvier residence, nearby plugged and abandoned (P&A'd) production wells, and mine core hole;
- Soil gas sampling and characterization;
- Water well investigation;
- Inspection of residences in close proximity to the Bouvier residence;
- Surface geology reconnaissance;
- Installation of a methane detection system in an existing structure located in close proximity to the methane seep at the Bouvier residence; and
- Excavation in the vicinity of the Trinidad MGP 1 P&A'd production well.

### FINDINGS

The presence of methane gas seeping at the Bouvier residence was confirmed as a result of the investigation. The gas composition is over 90% methane based on the air-free composition calculation.

The gas seep surveys indicate that the horizontal extent of the seepage has been defined and is primarily centered on a P&A production well (Trinidad MGP 1). The horizontal extent of seepage during the initial soil gas survey was limited to an area of approximately 27,000 square feet. The horizontal extent of seepage during the follow-up soil gas survey was approximately 25,000 square feet.

The Trinidad MGP 1 P&A'd production well was uncovered on May 23, 2007. The well is located below the southeastern corner of the crawl space for the Bouvier residence. Methane was observed to be leaking out of the well casing and around the well casing.

Methane gas has not been detected within or around the nearby residence located approximately 400 feet southeast of the explosion site (SE residence). However, a methane detection system was installed in the SE residence as an added safety precaution.

Methane seeps have not been detected in the vicinity of the nearby Trinidad MGP 2 and Trinidad MGP 3 P&A'd production well locations.

Analysis of a water sample from the Bouvier water well did not detect the presence of dissolved methane above the laboratory method detection limit. Dissolved methane was detected in the SE residence water well, but at a low concentration (0.00107 milligrams per liter).

Based on the findings of this investigation, it appears that the Trinidad MGP 1 P&A'd production well is the source of methane gas seepage at the ground surface in the vicinity of the Bouvier residence. It is possible that methane gas is migrating through the inside of the well and escaping through a leak in the casing.

## SECTION 1.0

### INTRODUCTION

This report, completed by LT Environmental, Inc. (LTE) for the Colorado Oil and Gas Conservation Commission (COGCC), is a summary of the emergency response investigation recently completed at the Bouvier House Explosion site located near the town of Weston, Las Animas County, Colorado.

Additional emergency response activities were conducted at the Primero School which is located approximately one mile east of the Bouvier residence. The Primero School has a previously identified methane gas seep in the vicinity of the bus garage. The explosion incident at the Bouvier residence renewed interest and concern for the safety of those in and around the school prompted additional seep monitoring and indoor air monitoring at and around the school property. The results of recent investigation activities at the Primero School gas seep are presented under separate cover.

#### 1.1 SITE DESCRIPTION

The primary area of concern is the Bouvier residence located at 19089 Highway 12 in Weston, Colorado in Las Animas County. The legal description for the residence is the northwest ¼, northwest ¼, Section 32, Township 33 South, Range 66 West. The geographic coordinates of the residence are 37.1322°N, 104.8086°W based on the 1983 North American Datum (NAD83) (Figure 1, Site Location Map).

The Bouvier residence is located at an elevation of approximately 6,760 feet above mean sea level (amsl).

When LTE arrived at the Bouvier property, debris (wood, glass, shingles, and insulation) from the residence was observed. The residence was under construction at the time of the explosion. The ground surface is gravel/soil covered in the area of the residential structure. Native grasses, forbs, and trees were noted surrounding the area cleared to construct the structure. The road into the property from Highway 12 turns north and then curves west at the residential structure and is used to access various operating gas production wells in the area and ranchette properties as part of the Adobe Ranch development. A site map for the Bouvier residence and surrounding properties is presented as Figure 2.



**Bouvier residence, view north**

An unnamed ephemeral stream derived from Molino Canyon is located to the north of the residential plot and, when active, flows from northwest to southeast toward the Purgatoire River which flows west to east approximately 0.25-miles south of the property. The ephemeral stream was flowing at the time of the survey. With the exception of the stream and river drainages, the area contains many hills with small sandstone cliffs. The hills rise approximately 400 feet above the Purgatoire River valley bottom.

## **1.2 PURPOSE AND SCOPE**

The purpose of this investigation was to identify the source of methane that was suspected of causing the explosion at the Bouvier House. Sources of methane investigated were:

- Nearby water wells;
- Coal outcrops;
- Nearby producing gas wells;
- A mine core hole;
- A plugged and abandoned (P&A'd) production well located in immediate proximity to the Bouvier residential structure; and
- Two nearby P&A'd gas wells.

This investigation also included mapping to determine the horizontal extent of methane seepage at the Bouvier residence and other tasks designed to help evaluate the potential sources and pathways of methane seepage, and assess the risk to human health and the environment from methane seepage. The additional investigation tasks summarized in this report included:

- Soil gas surveys at nearby P&A'd production wells and a mine core hole;
- Soil gas sampling and characterization;
- Water well investigation;
- Inspection of residences in close proximity to the Bouvier residence;
- Surface geology reconnaissance;
- Installation of a methane detection system in an existing structure located in close proximity to the methane seep at the Bouvier residence; and
- Document conditions in the vicinity of the Trinidad MGP 1 P&A'd production well during excavation by T Decker Investigations.

### **1.3 PROJECT BACKGROUND**

The emergency response investigation at the Bouvier residence was initiated on April 18, 2007 in response to an explosion that occurred on April 17, 2007. Figure 2 illustrates the layout of the Bouvier residence including the location of private water wells, P&A'd gas production wells, and other pertinent features.

According to the Stonewall Fire Department Fire Chief Mr. Larry Parsons, the house was under construction at the time of the explosion and the explosion occurred while construction workers were laying insulation in the basement. A portable halogen light was suspected to be the source that ignited methane gas that had accumulated within the basement. The fire department noted the presence of a coal outcrop in close proximity to the house. The COGCC database indicates that a P&A gas well is located in close proximity to the house.

### **1.4 REPORT ORGANIZATION**

This report is divided into nine sections including this introduction. Section 2.0 presents a summary of the findings from various soil gas surveys recently completed at the gas seep sites and on nearby areas. A summary of the gas sampling activities is presented in Section 3.0. Section 4.0 presents a summary of the water well investigation activities. Section 5.0 discusses the results of interior inspections of structures in close proximity to the methane gas seep. The geologic reconnaissance is described in Section 6.0. Section 7.0 discusses the methane detection system installation. A summary of the excavation activities conducted in the vicinity of the Trinidad MGP 1 well is provided in Section 8.0. Section 9.0 presents a summary of the findings for this investigation.

Various tables, photographs, and charts are presented throughout the text. The laboratory analytical results of groundwater samples are presented in tables which follow the text. Figures and pertinent supporting documentation are presented in separate sections following the text.



## SECTION 2.0

### SOIL GAS SURVEYS

#### 2.1 METHODOLOGY

LTE's two-person field team used a slide hammer and a 3-foot long steel rod to bore a 1/4-inch diameter hole to a depth of approximately 2 feet to 3 feet below ground surface (bgs). A 3-foot long section of plastic tubing, with the bottom 6-inches perforated, was lowered into the borehole and used to measure the concentration of methane in the subsurface with a hand-held Mine Safety Appliances (MSA) GasPort<sup>®</sup> four-gas meter. In addition to methane, concentrations of oxygen (O<sub>2</sub>), carbon monoxide (CO), and hydrogen sulfide (H<sub>2</sub>S) were also measured and recorded.

The locations of each measurement were based on surface accessibility, reported methane concentration, and desire to define the horizontal extent of seepage. With the exception of the points advanced in close proximity to the Bouvier residence, LTE utilized a grid-method to place borings. During the initial survey (April 18, 2007) of the Bouvier residence, the grid was approximately 300 feet by 300 feet and grid nodes were spaced approximately 50 feet apart. During the follow-up survey (May 24, 2007), the grid was approximately 450 feet by 450 feet and grid nodes in the vicinity of the Trinidad MGP 1 P&A'd well were spaced 25 feet apart. Grid nodes approximately 100 feet from the P&A'd well were spaced 50 feet apart and grid nodes on the edges of the survey area were spaced 100 feet apart. Surveys around the Trinidad MGP 2 and Trinidad MGP 3 P&A'd wells were performed April 24, 2007 using 300-feet by 300-foot grids with a 100-foot grid node spacing.

Each borehole location was mapped using a Trimble GeoXT<sup>®</sup> global positioning system (GPS). The GPS has the ability to locate the horizontal position of a point with sub-meter accuracy. In addition, the GPS has datalogging capability. Data (subsurface methane, O<sub>2</sub>, CO, and H<sub>2</sub>S concentration measurements) collected from each borehole were input into the GPS as the point was being logged by the GPS. Data were then transferred to a laptop computer for post processing and input into a geographic information system (GIS) for evaluation and presentation. Specification sheets for the four-gas meter and the GPS are included in Appendix A.

#### 2.2 INITIAL BOUVIER RESIDENCE SURVEY RESULTS

On April 18, 2007, LTE advanced 68 soil gas survey probes to delineate the horizontal extent of methane in the vicinity of the Bouvier residence. This survey included 13 soil gas survey probes in the vicinity of the residence located approximately 400 feet southeast of the Bouvier residence (SE residence).

Results of the survey indicated that methane was detected in close proximity (less than 100 feet) to the residence. Methane concentrations recorded from soil gas probes around the structure ranged from 2,000 parts per million (ppm) to 880,000 ppm (88 percent [%]). Methane was also detected in the soil at a concentration of 5,000 ppm immediately

outside the steel casing of the water well located approximately 55 feet west of the house. The horizontal extent of seepage at the ground surface was limited to an area of approximately 27,000 square feet. Figure 3 illustrates the results of the April 18, 2007 soil gas survey at the Bouvier residence.

Methane was not detected in the inactive septic tank or the leach field or in an area of stressed vegetation to the north of the Bouvier House. Visible seeps were not present in the flowing tributary stream north of the house. Methane was not detected around the perimeter of the SE residence to the southeast nor the shed east of the SE residence.

### **2.3 ABANDONED WELLS SURVEY RESULTS**

On April 24, 2007, LTE personnel conducted soil gas surveys around the P&A'd gas wells Trinidad MGP 2 (API #05-071-06070) and Trinidad MGP 3 (API #05-071-06048). These wells are located approximately 400 feet northwest and 475 feet east of the Bouvier residence, respectively.

Prior to the survey, LTE used the COGCC database position information, a GPS, and a magnetic locator to identify the suspected location of the P&A'd wells. LTE contacted Terry Surveying of Trinidad, Colorado to stake the location of the three P&A'd wells (Trinidad MGP 1 through 3) based on the plat information contained in the COGCC database. COGCC personnel also performed an extensive search for indications of the former well locations using a magnetic locator. The locations of the Trinidad MGP 1, MGP 2, and MGP 3 wells based on the COGCC database are depicted on Figure 2 by a white circle and black slash icon. The surveyed locations of MGP 2 and MGP 3, based on plat information, are depicted on Figure 2 by orange pentagon icons. The locations identified by COGCC personnel using the magnetic locator are depicted on Figure 2 by a green triangle.

LTE used a GPS to mark the staked surveyed location and the suspected location of the Trinidad MGP 2 and MGP 3 P&A'd wells based on the magnetic locator survey. The surveyed location and the magnetic locator survey location are within five feet of each other. Land survey and magnetic survey of the Trinidad MGP 1 (API #05-071-06045) P&A'd well could not be performed because the debris from the explosion limited access.

The results of the soil gas survey at the Trinidad MGP 2 and Trinidad MGP 3 P&A'd well locations indicated that methane was not detected at any of the 40 soil gas survey probes. The soil gas survey at the two P&A'd well locations also included soil gas probes adjacent to the magnetic locator and land survey stakes. Figure 3 illustrates the results of the soil gas survey at the P&A'd well locations north of the Bouvier residence.

### **2.4 MINE CORE HOLE SURVEY RESULTS**

Western Las Animas County has many abandoned mine core holes that were originally installed to assess coal reserves for mining companies in the area. These abandoned mine core holes have the potential to act as conduits for seeping methane gas if they are not abandoned appropriately.



Based on the information contained in the COGCC database, only one core hole was identified in the same section as the Bouvier residence. Mine core hole M39 is located approximately 2,400 feet east of the residence. LTE navigated to the mine core hole location using GPS but could not identify any surface features indicative of the mine core hole. No suspect dead vegetation was noted in the area. Therefore, no soil gas survey was conducted at the site.

## **2.5 FOLLOW-UP BOUVIER RESIDENCE SURVEY RESULTS**

The Trinidad MPG 1 P&A'd well was uncovered on May 23, 2007 as part of the investigation conducted by T Decker Investigation. Interested parties were invited to attend and document and collect data. LTE conducted a soil gas survey around the well and surrounding area on May 24, 2007.

LTE advanced 106 soil gas survey probes to delineate the horizontal extent of methane in the vicinity of the Trinidad MPG 1 P&A'd well. Results of the survey indicated that methane was detected in close proximity (less than 100 feet) to the P&A'd well. Methane concentrations recorded from soil gas probes ranged from 2,000 ppm to 81%. Methane was detected in the soil at a concentration 15% immediately outside the steel casing of the water well located approximately 55 feet west of the house. The horizontal extent of seepage at the ground surface during this survey was limited to an area of approximately 25,000 square feet. Figure 4 illustrates the results of the follow-up soil gas survey at the Bouvier residence.

In general, the horizontal extent and magnitude of seepage during the follow-up survey were relatively consistent with the initial survey. Figure 5 shows the horizontal extent of methane seepage during the initial soil gas survey and the follow-up soil gas survey.

## SECTION 3.0

### SOIL GAS SAMPLING

#### 3.1 SAMPLING METHODOLOGY

LTE collected a soil gas sample from the gas seep at the Bouvier residence on April 23, 2007. The sample was collected by advancing a soil gas probe into the soil to a depth of approximately 2 feet bgs. Tubing was inserted into the borehole and gas was extracted from the tubing into a mylar Cali-Bond 5<sup>®</sup> sample bag using a hand pump. The sample bag was sealed and shipped to Isotech Laboratories, Inc. located in Champaign, Illinois for analysis of gas composition and carbon and hydrogen isotopes of methane. The gas sample from the Bouvier residence was collected from an area immediately west of the garage where methane was detected at a concentration of 880,000 ppm (88%). Figure 3 illustrates the gas sample location at the Bouvier residence.

#### 3.2 ANALYTICAL RESULTS

Laboratory analytical results from compositional analysis indicate that methane was detected in the Bouvier gas sample at a concentration of 75.94%. Ethane was detected at a concentration of 0.0052%. Hydrocarbons with carbon chains larger than ethane were not detected in the sample. The remaining components of the gas sample were air with nitrogen and oxygen comprising the larger fractions of the sample. The laboratory analytical report including composition based on air-free calculations are included in Appendix B.

The gas sample was also analyzed for isotopes of carbon ( $\delta^{13}\text{C}_1$ ) and hydrogen ( $\delta\text{DC}_1$ ) of methane. Analytical results are as follows:

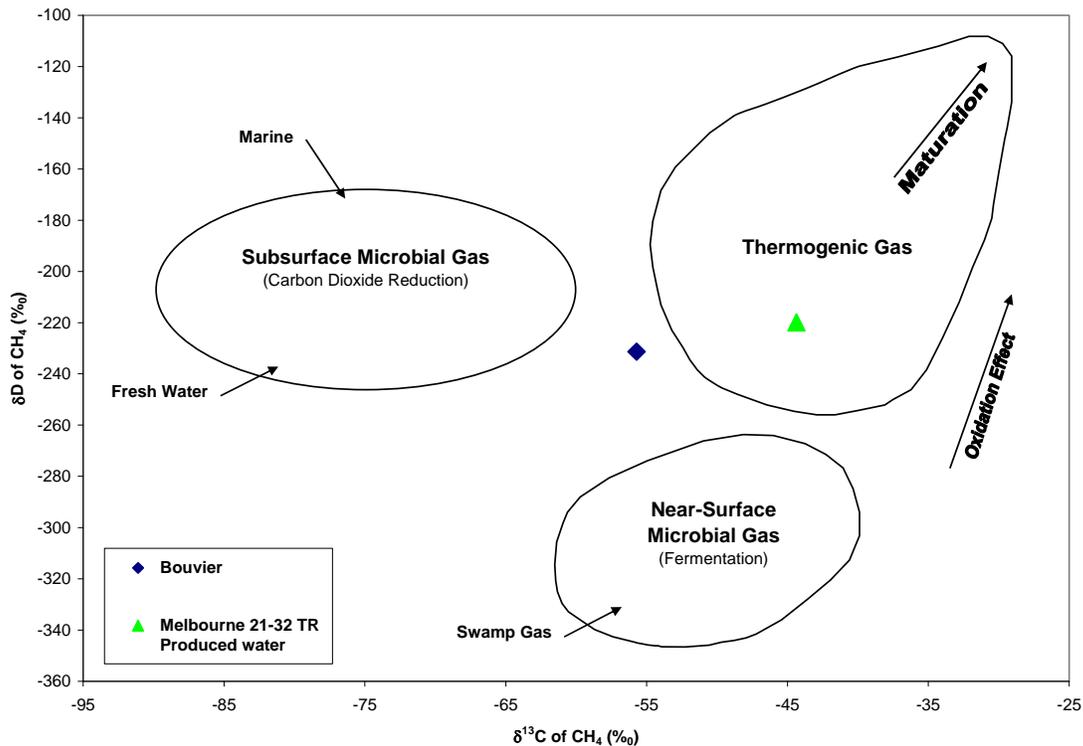
Sample ID	$\delta^{13}\text{C}_1$ ‰	$\delta\text{DC}_1$ ‰
Bouvier	-55.72	-231.3

The COGCC collected a produced water sample from one of the two active coal bed methane wells (Melbourne 21-32 TR) located approximately 700 feet northeast of the Bouvier residence. The water sample was analyzed for composition and isotopes  $\delta^{13}\text{C}_1$  and  $\delta\text{DC}_1$  of methane. Analytical results indicate the gas in the water is comprised of 82.40% methane and 0.012% ethane. The remaining components are nitrogen, O<sub>2</sub>, carbon dioxide and argon. The laboratory analytical report for the gas sample from produced water at the Melbourne 21-32 TR well is included in Appendix C.

The isotopic analytical results of the sample from produced water at the Melbourne 21-32 TR production well are presented below.

Sample ID	$\delta^{13}\text{C}_1$ ‰	$\delta\text{DC}_1$ ‰
Melbourne 21-32 TR Produced water	-44.37	-219.9

When these data are plotted, the Bouvier gas seep sample point is located slightly outside the margins of the thermogenic gas region, which may indicate a mixture of thermogenic and biogenic gases and/or alteration of the seeping gas. The gas sample from the Melbourne 21-32 TR plots in the thermogenic region. The isotope plot is presented below.



### 3.3 DATA COMPARISON

The well files in the COGCC database for the nearby Trinidad MGP 2 and Trinidad MGP 3 wells include coal bed methane desorption data from Colorado Geological Survey (CGS) Open File Report 81-4 (1981). Coal bed methane desorption data were not available for the Trinidad MGP 1 well.

The report evaluated the gas composition in coal samples from the Trinidad MGP 2 and Trinidad MGP 3 wells. The data indicate that propane, isobutene, and butane were detected in the gas at low concentrations in the shallower intervals and concentrations of these compounds decrease with depth. The following table developed from the CGS report summarizes coal gas composition results.

Well Name	Sample Interval (feet below surface)	Methane (%)	Ethane (%)	Propane (%)	Isobutane (%)	Butane (%)	Pentane (%)
Trinidad MGP 2	1,184-1,185	91.29	1.02	0.46	0.027	0.024	0.000
Trinidad MGP 2	1,190-1,190.75	93.89	0.075	0.055	0.006	0.002	0.000
Trinidad MGP 2	1,190.75-1,191.5	93.78	0.025	0.010	0.000	0.000	0.000
Trinidad MGP 2	1,205-1,209	92.04	0.15	0.000	0.000	0.000	0.000
Trinidad MGP 3	1,092.6-1,093.6	92.69	0.03	0.00	0.00	0.00	0.00
Trinidad MGP 3	1,099.3-1,103.3	93.68	0.02	0.00	0.00	0.00	0.00
Trinidad MGP 3	1,108-1,109	95.06	0.02	0.00	0.00	0.00	0.00
Trinidad MGP 3	1,157-1,158	96.68	0.02	0.00	0.00	0.00	0.00

In the report, carbon isotope ratios for selected samples are presented. The following table summarizes the results of the data from the Trinidad MGP 2 and Trinidad MGP 3 wells.

Well Name	Sample Interval (feet below surface)	$\delta^{13}\text{C}_1$ ‰
Trinidad MGP 2	1,184-1,185	-43.24
Trinidad MGP 2	1,190-1,190.75	-45.22
Trinidad MGP 2	1,190.75-1,191.5	-45.17
Trinidad MGP 2	1,205-1,209	-45.60
Trinidad MGP 3	1,092.6-1,093.6	-44.66
Trinidad MGP 3	1,099.3-1,103.3	-44.50
Trinidad MGP 3	1,108-1,109	-44.80
Trinidad MGP 3	1,157-1,158	-44.01
Trinidad MGP 3	1,360-1,363	-43.52

These carbon isotope ratios are slightly heavier than those measured in the sample from the Bouvier gas seep but more closely resemble the gas analysis from the Melbourne 21-32 TR well.

The coal bed methane desorption data, including carbon isotope analysis results, from the Trinidad MGP 2 and MGP 3 wells are included in Appendix D.

## SECTION 4.0

### WATER WELL INVESTIGATION

#### 4.1 PURPOSE AND METHODOLOGY

LTE reviewed the Colorado Division of Water Resources (CDWR) water well records to identify permitted water wells in the vicinity of the Bouvier residence. The purposes of the water well investigation are to determine if the Bouvier water well was a source of methane and to assess the risk of gas seepage to impact water wells and assist in the identification of the potential source of the methane gas seep.

LTE identified four permitted private water wells within a half-mile radius of the Bouvier residence. The Bouvier water well (Permit #259135) was identified on site. A hand-dug water well was identified approximately 400 feet southeast of the Bouvier residence and appears to be unpermitted. Two of the wells were listed as monitoring wells and were not investigated further. One well (Permit #248279) was listed as a domestic/livestock well but was located approximately 1,200 feet east of the Bouvier residence and therefore not investigated further. LTE measured the annular space in the well casing of the Bouvier water well and the SE residence water well for the presence or absence of methane gas using a portable combustible gas indicator. Figure 6 illustrates the location of permitted water wells within a half-mile radius of the Bouvier residence.

Prior to sampling the two water wells, LTE purged the well of water using an electric submersible pump. The SE residence well was purged using a Grundfos® Redi-flo 2 pump and clean plastic tubing. The purge water was allowed to discharge at the ground surface. Field measurements of pH, temperature, and conductivity were collected at regular intervals until measured values indicated that fresh formation water was entering the well. The purge rate was reduced to less than one gallon per minute (gpm) before samples were collected.

To sample the Bouvier water well, LTE used ABC Plumbing (a licensed water well contractor) of Pueblo, Colorado to pull the pitless adaptor to the surface. An electric generator and surface piping were used to operate the existing pump in the water well so that the well could be purged and sampled using the procedures described above.



**Bouvier water well during sampling, view southeast**

LTE collected water samples from each water well to assess the water quality, determine if methane is present, and conduct an analysis of gas in the water well, if present. The Bouvier water well and the SE residence hand dug water well were sampled on May 1, 2007. Water samples were submitted to Accutest Analytical Laboratory in Houston, Texas for analysis of the following parameters using the indicated U.S. Environmental Protection Agency (EPA) methods.

<b>Analyte</b>	<b>Laboratory Method</b>
Major Cations (dissolved Na, Ca, Mg, K, Fe)	EPA Method 6010/6020
Dissolved Metals (As, Ag, Ba, Cd, Cr, Pb, Se, Mn, and Cu)	EPA Method 6010/6020
Alkalinity (carbonate/bicarbonate)	EPA 300
Boron	EPA 212.3
Fluoride	EPA 300
Bromide	EPA 300
Sulfate	EPA 300
pH	EPA 150.1
Nitrate as Nitrogen (N)	EPA 353.3
Nitrite as Nitrogen (N)	EPA 353.3
Specific Conductance	EPA 120.1
Total dissolved solids (TDS)	EPA 160.1
Dissolved Methane	RSK 175
Benzene, toluene, ethylbenzene, and total xylenes (BTEX)	EPA 8260

## 4.2 INVESTIGATION RESULTS

### 4.2.1 Well Construction Information

Water well records indicate that the Bouvier water well was completed on November 13, 2004. Water was encountered at 68 feet and 130 feet bgs. The well was constructed with 4.5-inch diameter perforated plastic casing in three intervals from 60 feet to 80 feet bgs; 140 feet to 160 feet bgs; and 180 feet to 200 feet bgs. The driller (Boday Well Drilling) did not report encountering coal or gas during installation based on the information provided in the well construction and test report and personal interviews by LTE on April 23, 2007. Appendix E contains the water well construction and test report for the Bouvier water well.



**Bouvier water well**

The SE residence hand dug water well appears to be unpermitted with the CDWR but may pre-date any water well permitting regulations. The well is located outside the northwest corner of a wooden shed, east of the residence. The well is a hand-dug well with stone casing. The diameter of the well is approximately 5 feet. The depth to water was measured to be 12.75 feet below the top of the stone rim. The total depth was measured to be 22.5 feet below the top of the stone rim. The well is partially covered with several wooden planks.



SE residence hand-dug water well covered with planks, view southeast

#### 4.2.2 Well Inspection

The Bouvier water well is located approximately 50 feet west of the house. Mr. Larry Parsons, Fire Chief – Stonewall Fire Department, opened the well to measure for explosive vapors as part of his investigation on April 17, 2007 but did not detect methane. LTE personnel repeated the measurement on April 18, 2007 and detected methane at a concentration of 1,000 ppm. During LTE's April 23, 2007, LTE repeated the measurement inside the well casing and did not detect methane. Methane was detected around the outside of the well casing at a concentration of 5,000 ppm. LTE did not detect methane gas in or around the SE residence hand dug water well.

#### 4.2.3 Groundwater Analytical Results

Field measurements of pH, temperature, and conductivity were measured during purging. Well purging was conducted until field parameters stabilized, which is indicative that fresh formation water is being sampled as opposed to stagnant well water. The volume of water purged and field parameter values recorded upon the completion of purging activities at each well are as follows.

Well Name	Sample Date	Purge Time (minutes)	Purge Volume (gallons)	pH	Temp (degrees C)	Conductivity (uS/cm)
Bouvier	5/1/07	32	160	7.40	14.6	1,034
SE residence	5/1/07	30	160	7.70	8.2	1,044

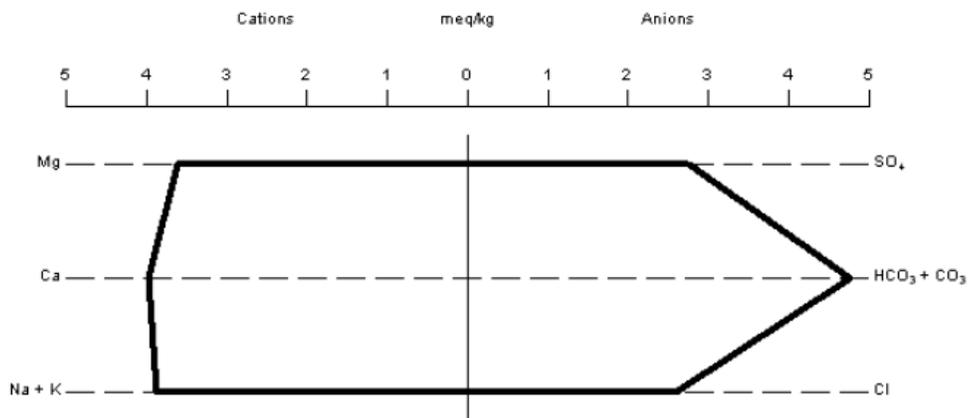
Tables 1 and 2 present the groundwater analytical results for the two water well samples collected. Groundwater analytical results indicate that dissolved methane was not detected in the Bouvier water well above the laboratory method detection limit of 0.0005 milligrams per liter (mg/L). However, methane was detected in the SE residence water

well at a concentration of 0.00107 mg/L. The dissolved methane concentration detected in the SE residence water well is below the 2 mg/L threshold level established by the COGCC. Therefore, the risk of methane desorbing from the water and creating potentially explosive conditions at the SE residence appears low.

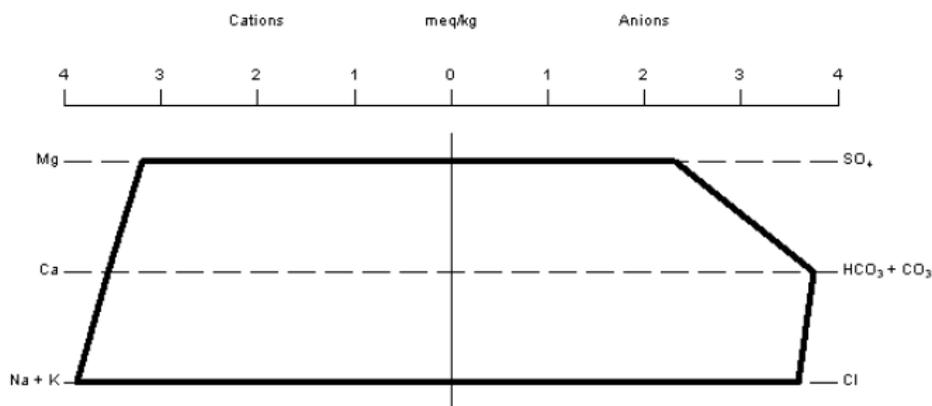
The other water quality analyses indicate that no regulatory ground water standards (Basic Standards for Ground Water, Regulation 41) have been exceeded. LTE plotted the major cation and anion concentrations on Stiff diagrams. The results indicate that the Bouvier water and SE residence water are somewhat similar water types. The Bouvier and SE residence waters have similar ratios of calcium, magnesium, sodium, and potassium.

The Stiff diagrams for the two samples are as follows:

### Bouvier – Stiff Diagram



### SE Residence – Stiff Diagram



Laboratory analytical results for the two water samples are presented on Tables 1 and 2. Laboratory analytical reports are included in Appendix F.

## SECTION 5.0

### INSPECTION OF NEARBY STRUCTURES

LTE inspected the interior of structures located in close proximity to the observed methane seep at the Bouvier residence. The purpose of the inspection was to survey the building interiors for methane concentrations.

There are no aboveground structures adjacent to the gas seep at the Bouvier house other than the structure damaged in the explosion. LTE inspected the interior of the septic tank located on the north side of the residence and the septic leach field located east of the residence. No methane was detected in these subsurface structures.



**Septic tank at Bouvier residence**

The SE residence structure is located at 19091 Highway 12, Weston, Colorado approximately 400 feet southeast of the Bouvier residence. The residence is a single story ranch home with a basement. A small wooden shed is located east of the residence.



**SE residence property, view east**

LTE inspected the surface soil surrounding the two structures on the SE residence property on April 18, 2007 and no methane was detected. On April 23, 2007, LTE inspected the interior portions of the structure with the permission of the SE residence landowner. No methane was detected in any areas of the main living floor or in the basement. The basement is constructed with a concrete floor.

Other equipment and debris are stored on the SE residence property but no additional habitable structures were observed.

## SECTION 6.0

### GEOLOGIC RECONNAISSANCE

LTE utilized the COGCC production well database, the Bouvier water well drilling log, literature research, and a reconnaissance of the nearby surface geology to describe the regional and local geologic setting at the site.

#### 6.1 REGIONAL GEOLOGY

The Bouvier seep is located in the Raton Basin of Colorado. The Raton Basin is an asymmetric syncline which developed in the late Cretaceous-early Tertiary as part of the Laramide Orogeny. The basin covers an area of approximately 2,200 square miles. The Spanish Peaks, formed by igneous intrusion, and associated radial dikes dominate the west central portion of the basin.

The Raton Basin has had a long history of coal mining and is currently an active coal bed methane development area. The two primary coal-bearing formations in the Raton Basin are the Raton Formation (Tr) and the Vermejo Formation (Kv).

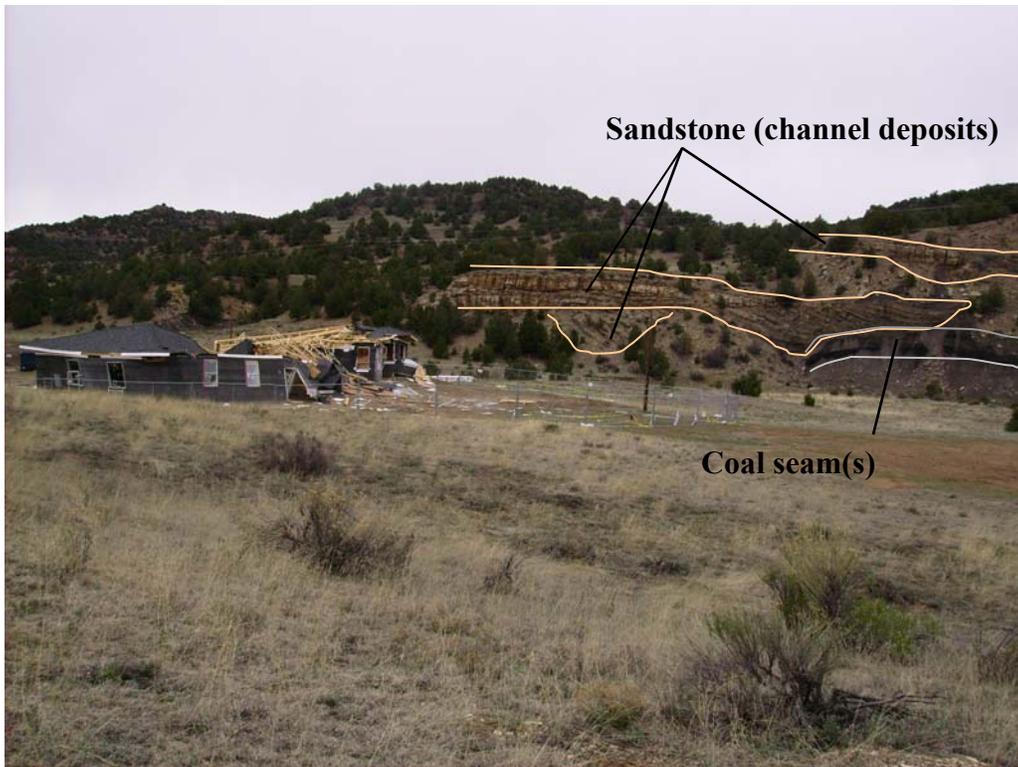
The Tr outcrops in much of the Raton Basin including the area surrounding the Bouvier House. Drilling logs for the Trinidad MGP wells and the Melbourne wells indicate that the Kv is approximately 1,100 feet bgs at the site and the Trinidad sandstone is approximately 1,400 feet bgs at the site.

#### 6.2 LOCAL GEOLOGY

LTE performed a surface geology reconnaissance on April 24, 2007 to develop a schematic geologic cross-section in the area of the Bouvier gas seep and specifically to determine if a coal seam is present beneath the residence near the ground surface. Detailed geologic mapping of the area was not available. The schematic geologic cross-section was developed using information from the Bouvier water well construction and test report and LTE's surface observations of lithology. Lithologic information in the Trinidad MGP wells was not recorded for the upper 300 feet bgs and lithologic information for the Melbourne wells starts at 350 feet bgs.

The Tr outcrops at the Bouvier gas seep site. Sandstone layers of the Tr form many of the ridges surrounding the site. It appears that the stratigraphy is dipping to the northwest only a few degrees, though a measurement could not be made as no reliable planar surfaces were identified.

LTE has sketched a near surface geologic cross-section based on the stratigraphy documented in the Bouvier well construction report and field observations. The line of section (A-A') is illustrated on Figure 2, the cross-section is presented as Figure 7.



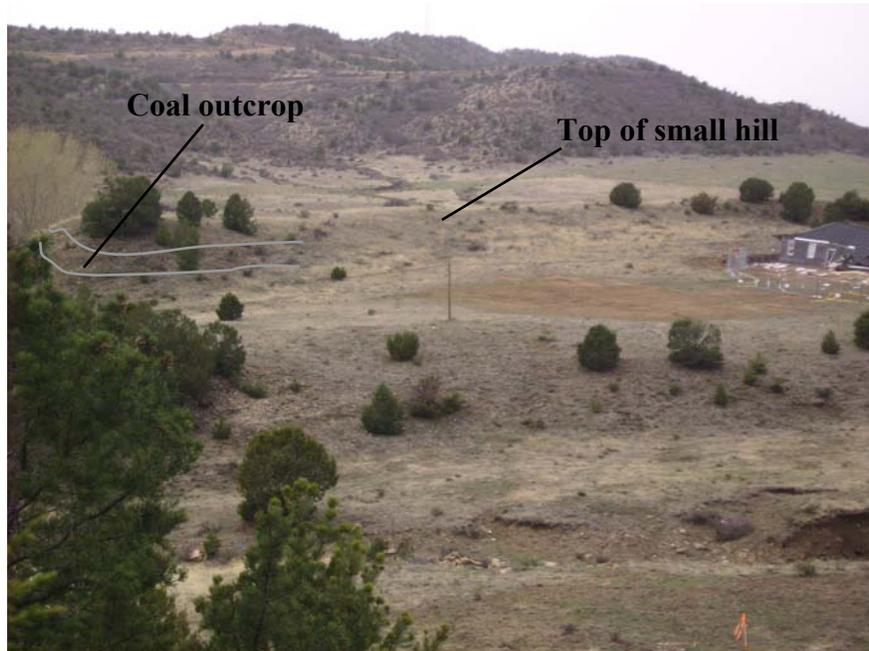
**Sandstone forming ridges north of Bouvier residence, view northwest**

A relatively large coal seam and channel sand deposit can be seen on the cut bank of the tributary stream north of the Bouvier residence (as pictured below). The planar surface of the coal seam projects southward above the present ground surface elevation at the Bouvier residence.



**Coal seam outcrop north of Bouvier residence, view north**

A small hill with a sandstone layer cap is located south of the residence. LTE observed a coal outcrop on the hill but at an elevation which projects the planar surface of the coal seam above the ground surface at the residence.

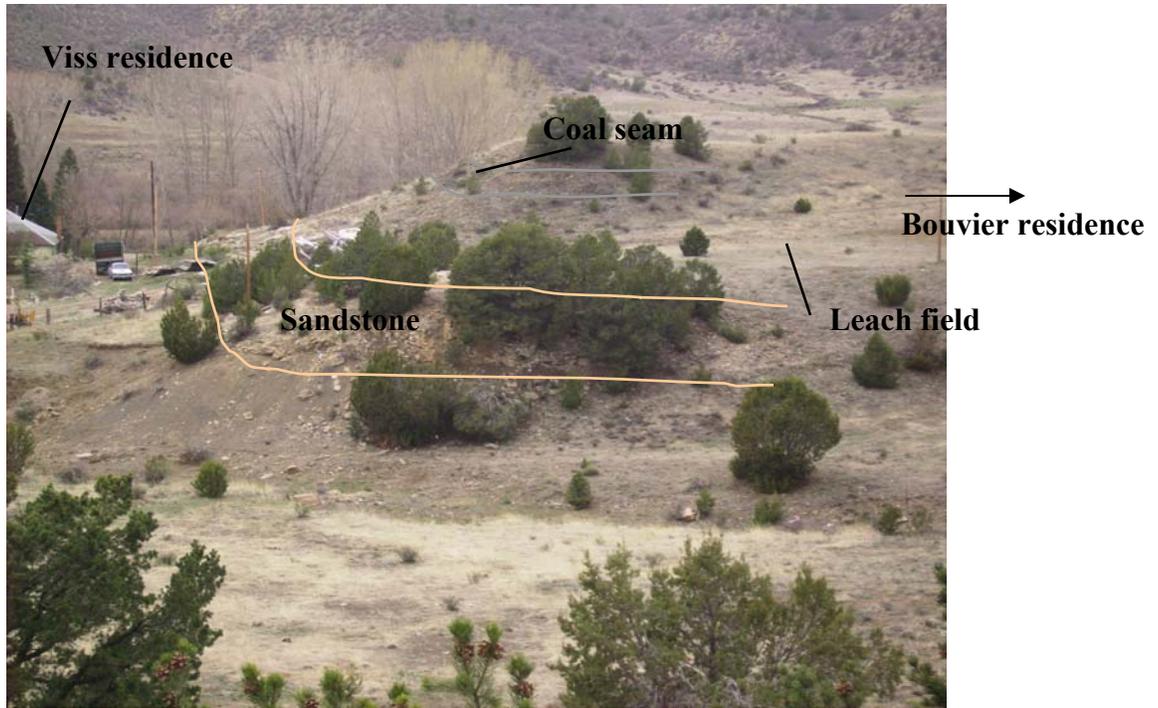


**Small hill south of Bouvier residence, view south**

A sandstone outcrop can be observed at the base of the hill on the west side near Highway 12. The sandstone outcrop at the base of the hill is exposed on the SE residence property east of the Bouvier residence but pinches out or is covered to the north near the tributary stream.



**Sandstone outcrop, south side of hill, north of Highway 12, view north**



**Sandstone outcrop and coal seam outcrop, east end of small hill, view south**

LTE observed coal “float” at two locations southwest of the Bouvier residence along the entrance road to the property. Much of the area is covered so it is difficult to determine if another small coal layer is present or if the coal observed is float from a formation uphill.

LTE observed a coal outcrop within the tributary channel northwest of the Bouvier that appears to be stratigraphically positioned below the prominent sandstone layer seen in the Highway 12 road cut. Since coal material was not observed during the drilling of the Bouvier water well, it is likely that this coal seam pinches out to the south. This coal seam is outside the line of section (A-A’) so its stratigraphic position below the tributary channel has been estimated.

Based on the field observations, water well drilling log information, and interviews with the driller, LTE did not find evidence of a shallow (less than 20 feet) coal seam beneath the Bouvier residence. Based on the regional stratigraphy, coal seams are present beneath the residence, however, there are no documented or observed coal seams beneath the residence within 200 feet of the ground surface based on water well drilling records for the Bouvier water well.

## SECTION 7.0

### METHANE DETECTION SYSTEM INSTALLATION

Due to the presence of seeping methane gas in close proximity to residential structures, the COGCC requested that methane detection systems be installed in nearby structures as an added safety precaution for the occupants.

On May 24, 2007, LTE installed a methane detection system in the SE residence. One Macurco<sup>®</sup> methane detector was installed in the main living area of the SE residence and one detector was installed in the basement of the SE residence. The detectors are set to alarm at 20% of the LEL for methane. The equipment specifications for the Macurco<sup>®</sup> methane detectors are included in Appendix G. No other structures are present in close proximity to the Bouvier gas seep.

## SECTION 8.0

### EXCAVATION

The following section summarizes the excavation activities conducted at the Bouvier property between May 22, 2007 and May 24, 2007. The excavation was part of a larger investigation conducted by T Decker Investigations at the request of Farmer's Insurance Company. Interested parties were invited to attend and participate.

#### 8.1 PURPOSE

The purpose of the excavation activities at the Bouvier property was to uncover the Trinidad MPG 1 P&A'd well, inspect the top of the well casing for possible leaks, and observe the area where the well casing penetrates the bedrock and determine whether methane gas is seeping through fractures in the bedrock around the outside of the well casing. LTE also conducted health and safety monitoring during excavation activities.

#### 8.2 EXCAVATION RESULTS

Excavation activities were initiated on May 22, 2007. Febrarro Construction Co. of Trinidad, Colorado used an excavator to remove debris from the explosion site. Once all debris was removed, an excavator was used to slowly scrape the soil in the area of the crawl space for the Bouvier residence. The soil was removed to a total depth of approximately 2 feet bgs.



Trinidad MGP 1 P&A'd well, view southeast

The P&A'd well was identified near the southeastern corner of the crawl space at a depth of approximately 2 feet bgs. LTE observed a plate welded to the well casing, however, the plate did not completely cover the casing. LTE placed tubing between the plate and the well casing and measured methane gas leaking from the well at a concentration of 92%.

The soil around the well casing was excavated in order to observe the area where the well casing penetrates the bedrock. The soil was excavated to a total depth of approximately 14 feet bgs. Clayey sand with gravel was encountered from the ground surface to 9 feet bgs. Fractured sandstone was observed from 9 feet bgs to 14 feet bgs. The sandstone at 14 feet bgs appeared to be less fractured than the overlying sandstone. Concrete was observed around the outside of the well casing at a depth of approximately 7 feet bgs.

## SECTION 9.0

### SUMMARY

This section summarizes some of the observations made by LTE from the findings of the investigation activities.

The presence of methane gas seeping at the Bouvier House was confirmed following the initial emergency response investigation activities. The source of the gas appears to be the Trinidad MGP 1 P&A'd gas well. The gas composition is over 90% methane based on the air-free composition calculation.

The gas seep surveys indicate that the horizontal extent of the seepage has been defined and is primarily centered around the Trinidad MGP 1 well. The horizontal extent of seepage during the initial survey (April 18, 2007) was approximately 27,000 square feet. The horizontal extent of seepage during the follow-up survey (May 24, 2007) was approximately 25,000 square feet. In general, the extent and magnitude of seepage during the follow-up survey is consistent with the initial survey.

The Trinidad MGP 1 P&A'd production well was uncovered on May 23, 2007. The well is located below the southeastern corner of the crawl space for the Bouvier residence. Methane was observed to be leaking out of the well casing during field activities.

The isotopic analysis of the methane indicates that the gas may be comprised of a mixture of both thermogenic and biogenic methane. The isotopic composition is dissimilar to the methane gas present in produced water from a nearby active coal bed methane production well (Melbourne 21-32 TR).

Methane gas has not been detected within or around the nearby SE residence. A methane detection system was installed in this SE residence as an added safety precaution.

Methane seeps have not been detected in the vicinity of the nearby Trinidad MGP 2 and Trinidad MGP 3 P&A'd production well locations.

Analysis of a water sample from the Bouvier water well did not detect the presence of dissolved methane above the laboratory method detection limit. Dissolved methane was detected in the SE residence water well, but at a very low concentration (0.00107 mg/L).

Geologic reconnaissance and well drilling information suggest that the Bouvier house is not underlain by a shallow coal seam within approximately 40 feet of the ground surface.

The soil surrounding the well casing was excavated on the north side of the casing to a depth of 14 feet bgs. No coal was observed in the excavation.

## **TABLES**



**TABLE 1**  
**GROUNDWATER ANALYTICAL RESULTS - ORGANICS**  
**BOUVIER GAS SEEP**  
**LAS ANIMAS COUNTY, COLORADO**

**COLORADO OIL AND GAS CONSERVATION COMMISSION**

<b>Sample ID</b>	<b>Sample Date</b>	<b>Benzene (mg/L)</b>	<b>Toluene (mg/L)</b>	<b>Ethyl-benzene (mg/L)</b>	<b>Xylenes (mg/L)</b>	<b>Dissolved Methane (mg/L)</b>
Bouvier	5/1/2007	<0.00021	0.00047	<0.00035	<0.00055	<0.00030
SE Residence	5/1/2007	<0.00021	<0.00023	<0.00035	<0.00055	0.00107
<b>Water Quality Standard*</b>		0.005	1.0	0.7	10.0	2.0

**Notes:**

< = less than stated detection limit

mg/L = milligrams per Liter

\* Colorado Groundwater Quality Standards with the exception of methane, which is a threshold value established by the Colorado Oil and Gas Conservation Commission

**TABLE 2**  
**GROUNDWATER ANALYTICAL RESULTS - INORGANICS**  
**BOUVIER GAS SEEP**  
**LAS ANIMAS COUNTY, COLORADO**

**COLORADO OIL AND GAS CONSERVATION COMMISSION**

Sample ID	Sample Date	MAJOR ANIONS						HALIDES		MAJOR CATIONS					
		CO <sub>3</sub> (mg/L)	HCO <sub>3</sub> (mg/L)	NO <sub>3</sub> -N (mg/L)	NO <sub>2</sub> -N (mg/L)	SO <sub>4</sub> (mg/L)	Cl (mg/L)	Br (mg/L)	F (mg/L)	Ca (mg/L)	Na (mg/L)	K (mg/L)	Mg (mg/L)	Fe (mg/L)	B (mg/L)
Bouvier	5/1/2007	8.1	274	0.20	<0.0030	132	92.0	1.6	0.39	79.800	86.800	3.640	43.900	0.0450	0.0089
SE Residence	5/1/2007	<0.80	227	0.10	<0.0030	111	127	2.0	0.35	71.100	87.600	2.480	38.900	<0.019	<0.0089
<b>Water Quality Standard</b>		--	--	10.0	1.0	250	250	--	4.0	--	--	--	--	0.3	--

Sample ID	Sample Date	DISSOLVED METALS									pH (mg/L)	TDS (mg/L)	EC (uS/cm)
		As (mg/L)	Ba (mg/L)	Cd (mg/L)	Cr (mg/L)	Pb (mg/L)	Se (mg/L)	Mn (mg/L)	Ag (mg/L)	Cu (mg/L)			
Bouvier	5/1/2007	<0.0027	0.0456	<0.00024	<0.0018	0.0238	<0.0032	0.0227	<0.00050	0.0051	7.2	605	1,170
SE Residence	5/1/2007	<0.0027	0.0726	<0.00024	<0.0018	0.0025	0.0035	<0.0077	<0.00050	0.0064	7.0	604	1,150
<b>Water Quality Standard</b>		0.05	2.0	0.005	0.1	0.05	0.05	0.05	0.05	1	6.5-8.5	--	--

**Notes:**

< = less than stated laboratory detection limit

mg/L = milligrams per liter

uS/cm - micro-Siemens per centimeter

water quality standards established by Colorado Department of Public Health and Environment

-- indicates water quality standard not established

**Bold** indicates concentration exceeds water quality standard

\* sample not yet analyzed

Samples analyzed for chloride and electrical conductance were collected on 2/23/07

CO<sub>3</sub>- Carbonate

HCO<sub>3</sub>-Bicarbonate

Cl - Chloride

NO<sub>3</sub>-N - Nitrate

NO<sub>2</sub>-N - Nitrite

SO<sub>4</sub> - Sulfate

Fe - Iron

K - Potassium

Mg - Magnesium

Na - Sodium

As - Arsenic

Ba - Barium

Cd - Cadmium

Cr - Chromium

Se - Selenium

Mn - Manganese

F - Flouride

TDS - Total Dissolved Solids

EC - Electrical conductance

Cu - Copper

Ca -Calcium

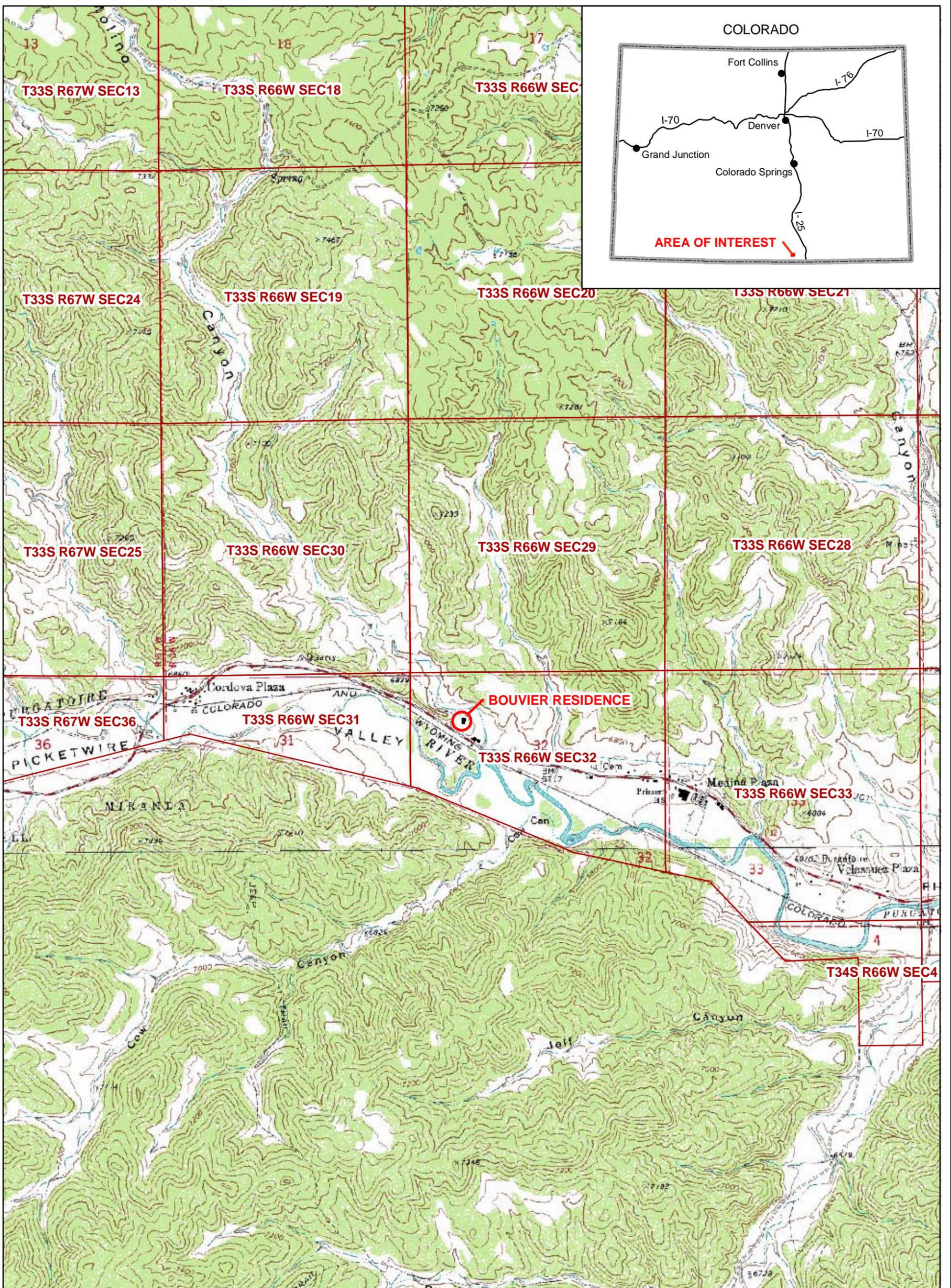
Pb - Lead

Ag - Silver

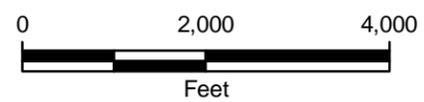
B - Boron

## FIGURES





Map Source:  
 USDA/NRCS - National Cartography & Geospatial Center

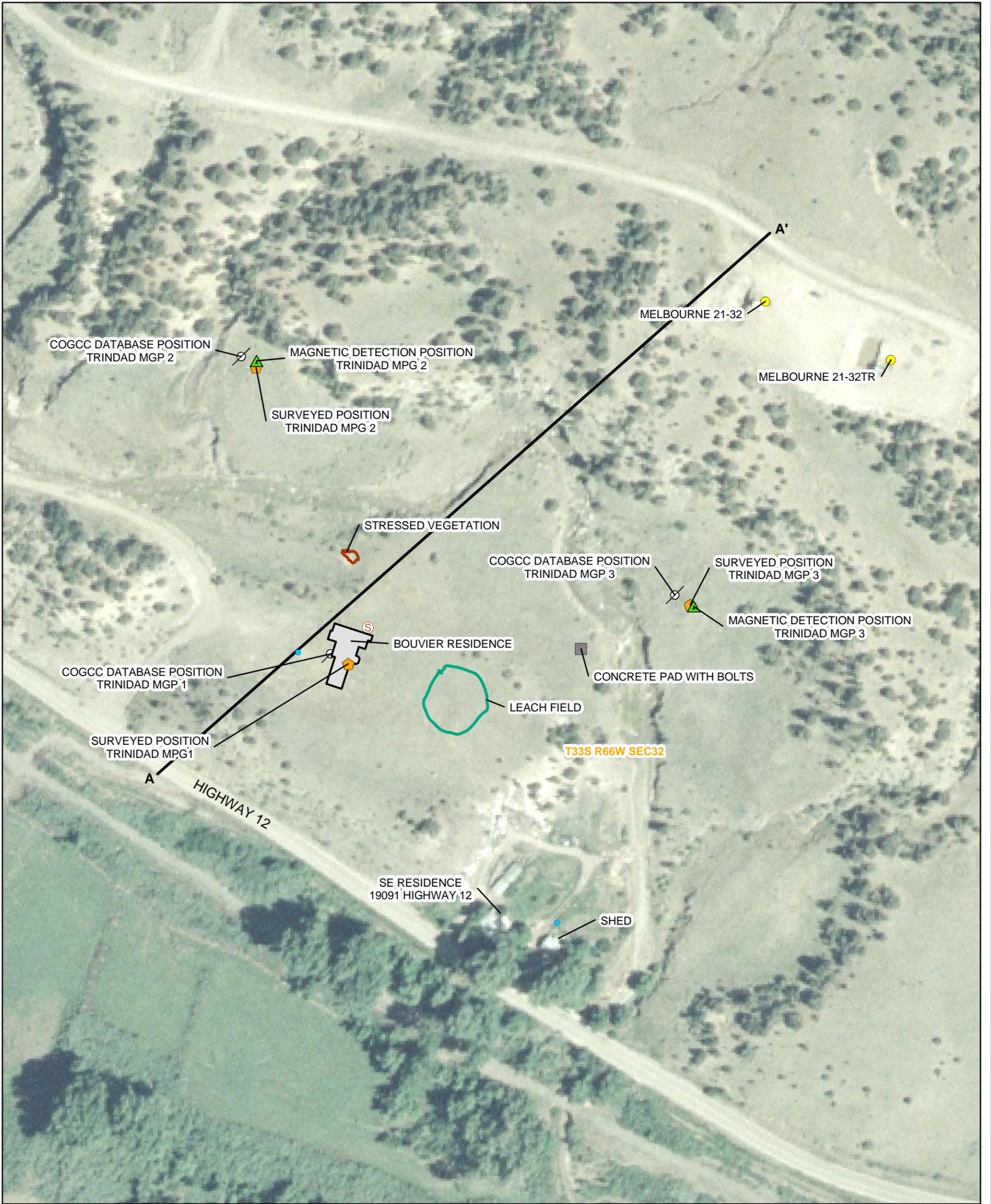


**LEGEND**

-  SITE LOCATION
-  TOWNSHIP, RANGE, AND SECTION

FIGURE 1  
 SITE LOCATION MAP  
 BOUVIER RESIDENCE  
 19089 HIGHWAY 12  
 LAS ANIMAS COUNTY, COLORADO  
 COLORADO OIL AND GAS CONSERVATION COMMISSION

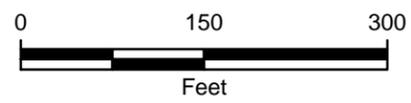




Map Source:  
 USDA, National Agriculture Imagery Program, 2005

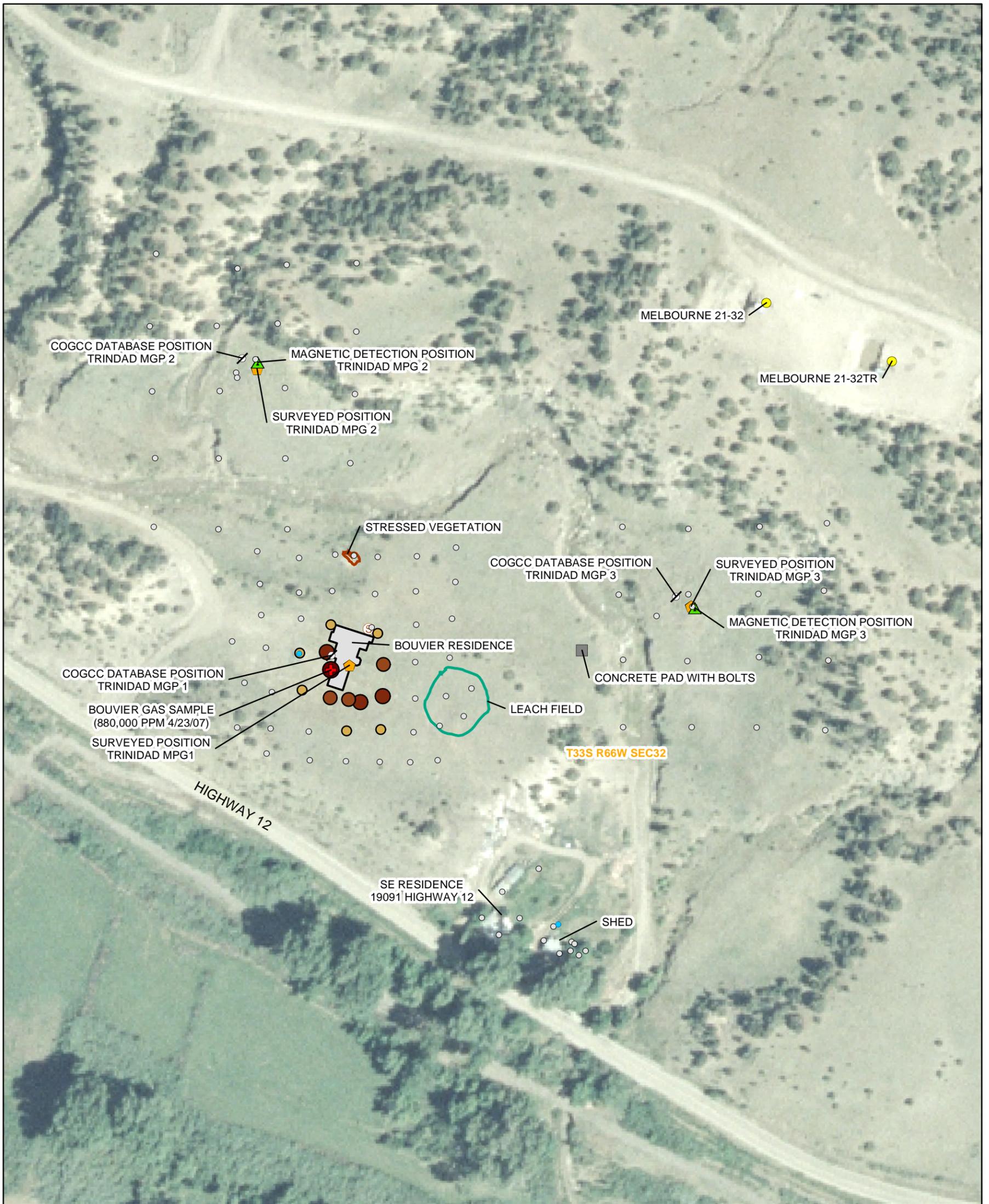
**LEGEND**

- 
ABANDONED PRODUCTION WELL (COGCC)
  - 
ACTIVE PRODUCTION WELL (COGCC)
  - 
SEPTIC TANK
  - 
WATER WELL (SURVEYED BY GPS)
  - 
SURVEYED WELL LOCATION
  - 
METAL DETECTED WELL LOCATION
  - 
APPROXIMATE BOUVIER RESIDENCE
- 
CROSS SECTION LINE



**FIGURE 2**  
**SITE MAP**  
**BOUVIER RESIDENCE**  
**19089 HIGHWAY 12**  
**LAS ANIMAS COUNTY, COLORADO**  
**COLORADO OIL AND GAS CONSERVATION COMMISSION**





Map Source:  
USDA, National Agriculture Imagery Program, 2005

**LEGEND**

**SUBSURFACE METHANE MEASUREMENTS**

- 0 ppm
- 1ppm - 500 ppm
- 501 ppm - 5%
- 6% - 15%
- 16% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

- ⚡ ABANDONED PRODUCTION WELL (COGCC)
- ACTIVE PRODUCTION WELL (COGCC)
- WATER WELL (SURVEYED BY GPS)
- ⊕ GAS SAMPLE
- ⬠ SURVEYED WELL LOCATION
- ▲ METAL DETECTED WELL LOCATION
- ⬠ APPROXIMATE BOUVIER RESIDENCE

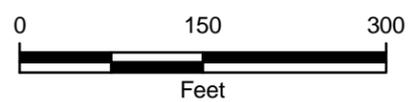
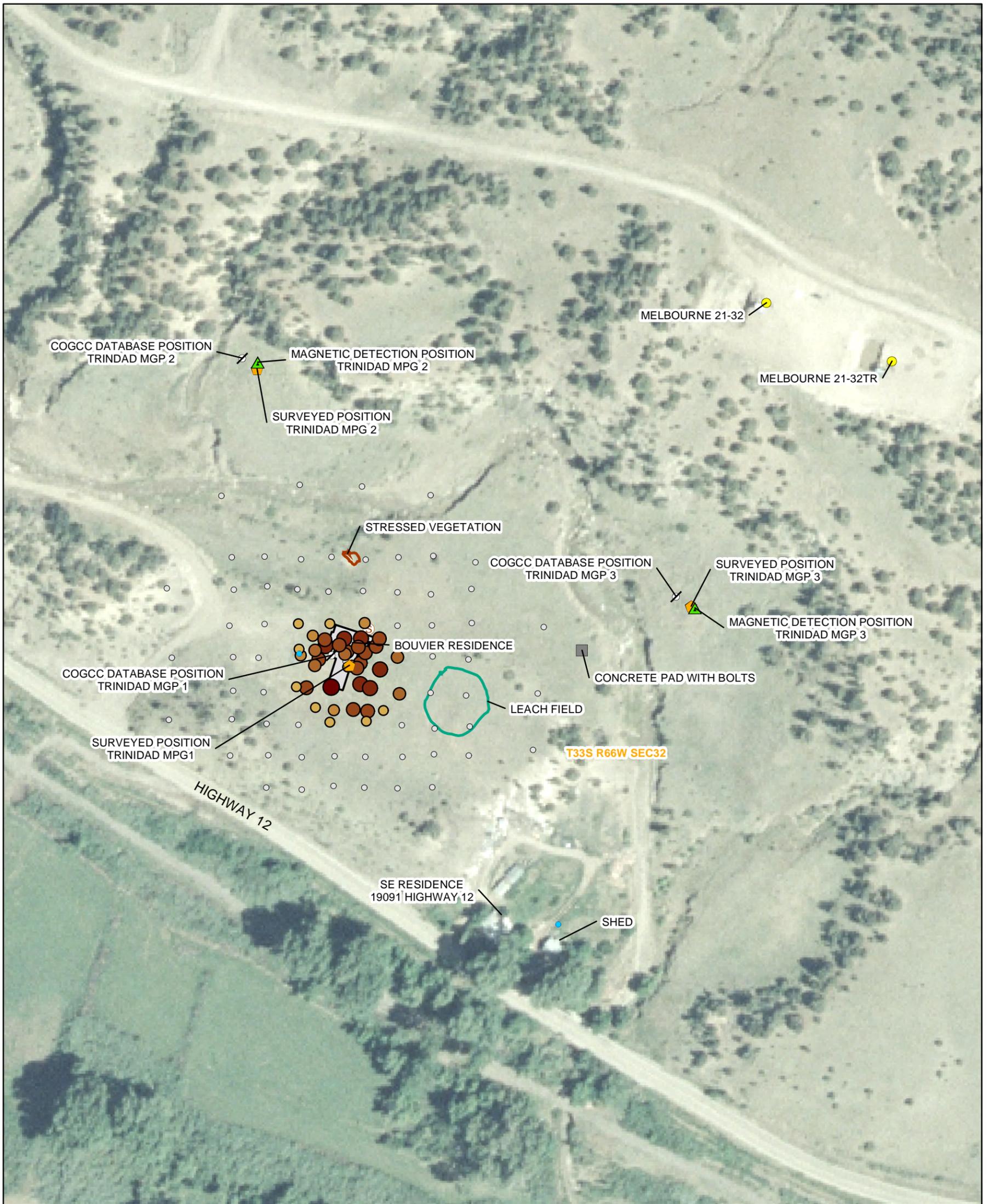


FIGURE 3  
INITIAL SOIL GAS SURVEY RESULTS  
BOUVIER RESIDENCE  
19089 HIGHWAY 12  
LAS ANIMAS COUNTY, COLORADO  
COLORADO OIL AND GAS CONSERVATION COMMISSION



SURVEY PERFORMED ON APRIL 18 & 24, 2007



Map Source:  
USDA, National Agriculture Imagery Program, 2005

**LEGEND**

**SUBSURFACE METHANE MEASUREMENTS**

- 0 ppm
- 1ppm - 500 ppm
- 501 ppm - 5%
- 6% - 15%
- 16% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

- ⚡ ABANDONED PRODUCTION WELL (COGCC)
- ACTIVE PRODUCTION WELL (COGCC)
- WATER WELL (SURVEYED BY GPS)
- SURVEYED WELL LOCATION
- ▲ METAL DETECTED WELL LOCATION
- APPROXIMATE BOUVIER RESIDENCE

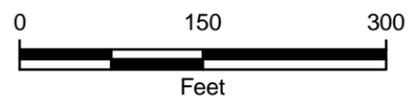


FIGURE 4  
FOLLOW-UP SOIL GAS SURVEY RESULTS  
BOUVIER RESIDENCE  
19089 HIGHWAY 12  
LAS ANIMAS COUNTY, COLORADO  
COLORADO OIL AND GAS CONSERVATION COMMISSION



SURVEY PERFORMED ON MAY 24, 2007



Map Source:  
 USDA, National Agriculture Imagery Program, 2005

**LEGEND**

**SUBSURFACE METHANE MEASUREMENTS**

- 0 ppm
- 1ppm - 500 ppm
- 501 ppm - 5%
- 6% - 15%
- 16% - 25%
- 26% - 50%
- 51% - 75%
- 76% - 100%

- ⚡ ABANDONED PRODUCTION WELL (COGCC)
- ACTIVE PRODUCTION WELL (COGCC)
- WATER WELL (SURVEYED BY GPS)
- SURVEYED WELL LOCATION
- ▲ METAL DETECTED WELL LOCATION
- APPROXIMATE BOUVIER RESIDENCE

**EXTENT OF METHANE SEEPAGE**

- ▭ MAY 2007
- ▭ APRIL 2007

SURVEY PERFORMED ON MAY 24, 2007

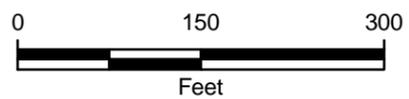
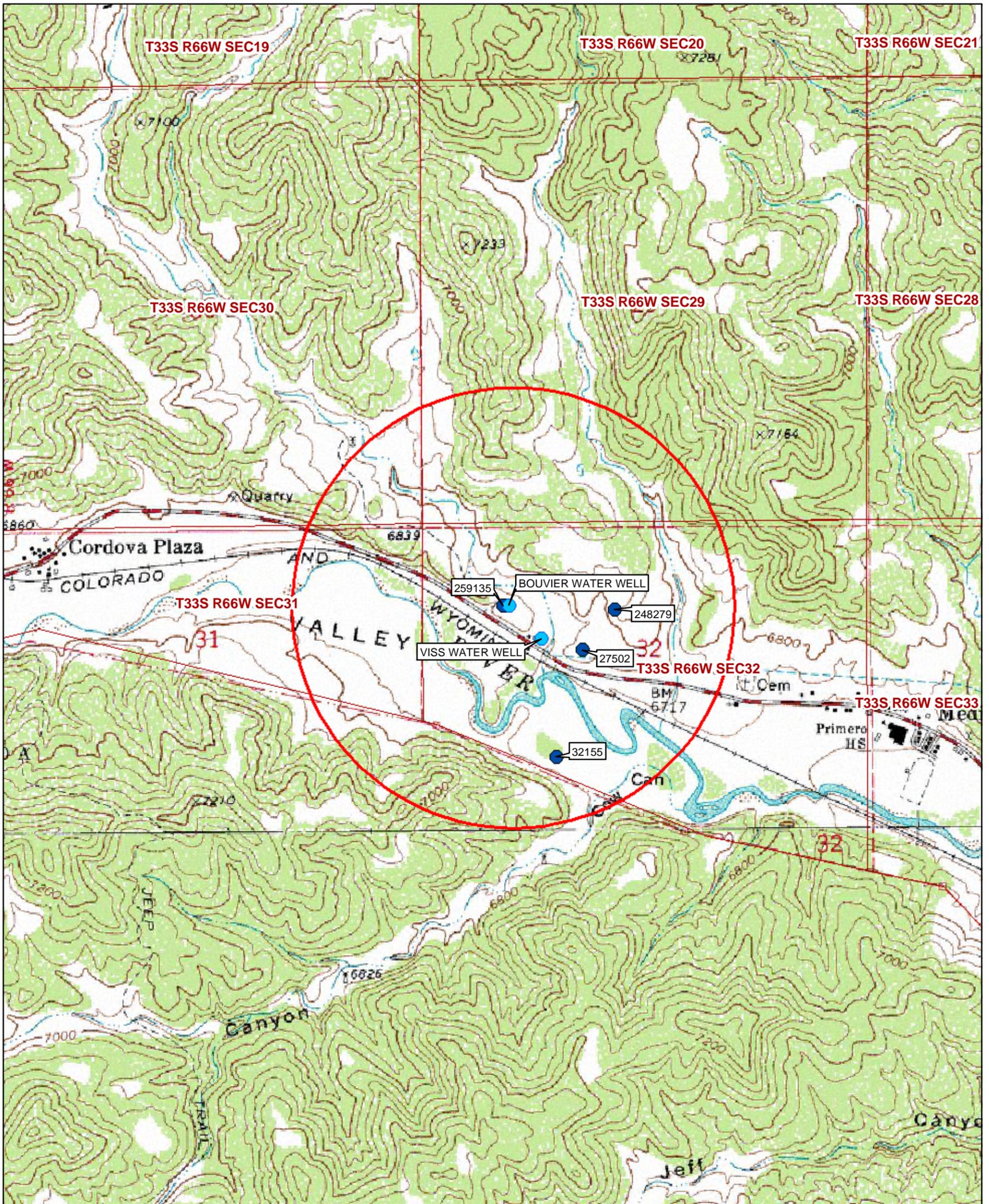


FIGURE 5  
 HORIZONTAL EXTENT OF METHANE SEEPAGE  
 BOUVIER RESIDENCE  
 19089 HIGHWAY 12  
 LAS ANIMAS COUNTY, COLORADO  
 COLORADO OIL AND GAS CONSERVATION COMMISSION



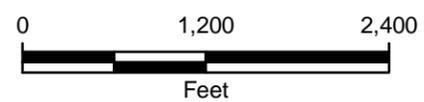


Map Source:  
 USDA/NRCS - National Cartography & Geospatial Center

**LEGEND**

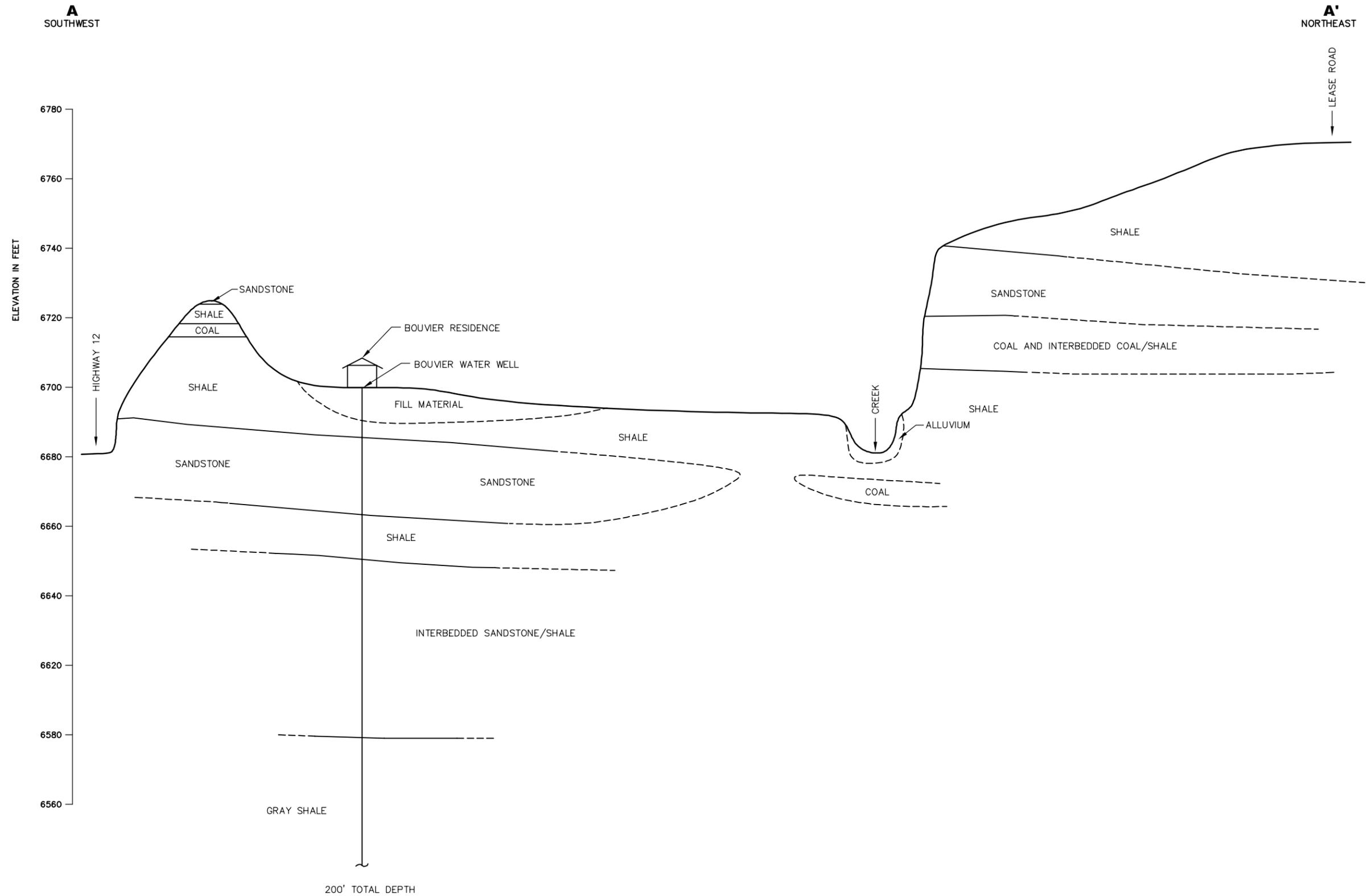
- WATER WELL (SURVEYED BY GPS)
- WATER WELL (DWR RECORDS)
- HALF MILE RADIUS
- TOWNSHIP, RANGE, AND SECTION

DIVISION OF WATER RESOURCES (DWR)  
 WELLS LABELED WITH PERMIT NUMBERS



**FIGURE 6**  
 WATER WELL LOCATION MAP  
 BOUVIER RESIDENCE  
 19089 HIGHWAY 12  
 LAS ANIMAS COUNTY, COLORADO  
 COLORADO OIL AND GAS CONSERVATION COMMISSION





HORIZONTAL SCALE  
1" = 100'

VERTICAL SCALE  
1" = 30'

**LEGEND**

- GROUND SURFACE
- - - CONTACT LINE (DASHED WHERE INFERRED)

SOURCE:  
WATER WELL DRILLER'S LOG  
AND LTE FIELD RECONNAISSANCE

**FIGURE 7**  
NEAR SURFACE SCHEMATIC GEOLOGIC  
CROSS SECTION  
BOUVIER RESIDENCE  
19089 HIGHWAY 12  
LAS ANIMAS COUNTY, CO  
COLORADO OIL AND GAS CONSERVATION COMMISSION



**APPENDIX A**  
**SOIL GAS SURVEY EQUIPMENT SPECIFICATIONS**



The Gasport Gas Tester is designed for gas utility workers to detect methane and certain toxic gases. It is a reliable, simple, versatile tool to help your service technicians get the job done quickly! With multiple ranges and sensing capabilities built into one rugged housing, the Gasport Tester simplifies your work by reducing the number of meters you have to carry on the job.



## Applications

The Gasport Tester's poison-tolerant methane sensor provides three measurement ranges for your daily service needs:

- Open air, safety sampling
- Small, in-home leak detection
- Street/outdoor service line leak detection



## Features and Benefits

- **Proven in field use—rugged and reliable**  
Less costly to maintain, less time in repair
- **Multiple functions in one instrument**  
No need to buy, carry & maintain multiple instruments
- **New, poison-tolerant combustible gas sensor**  
Reduces meter ownership costs
- **User-selectable, “silent” operation mode**  
Reduces customer disturbances and worries
- **Fast warm up time**  
Fastest warm up time in industry saves time
- **Can monitor up to four gases at a time**  
Fewer instruments to carry
- **Show all gas concentrations simultaneously**  
Eliminates guesswork on what reading is displayed
- **Autoranging methane sensor**  
Automatically switches between 0-5% and 5-100% methane ranges
- **Gas readings recorded for later retrieval**  
Can double check readings after job is done
- **Simple manual or automated calibration options**  
Reduces training time and helps ensure accuracy
- **Intrinsically safe**  
Meets safety standards for work in hazardous areas
- **Lifetime warranty on case and electronics**  
Reduced maintenance and lifetime costs

## Specifications

Gas	Range	Resolution
Methane	0–5000 ppm	50 ppm
Methane	0–100% LEL or 0–5% CH <sub>4</sub>	1 % LEL or 0.1% CH <sub>4</sub>
Methane	5–100% CH <sub>4</sub>	1% CH <sub>4</sub>
Oxygen	0–25%	0.1%
Carbon Monoxide	0–1000 ppm	1 ppm
Hydrogen Sulfide	0–100 ppm	1 ppm

- Battery types:** NiCd and Alkaline
- Case material:** Impact resistant, stainless-steel-fiber-filled polycarbonate
- Operating temperature:** normal -10 to 40°C; extended -20 to 50°C
- Operating humidity:** Continuous: 15-95% RH, non-condensing  
Intermittent duty: 5-95% RH, non condensing
- Warm up time:** Less than 20 seconds to initial readings
- Datalog capacity:** 12 hours
- Input:** 3 clearly marked, metal domed keys
- Warranty:** Case and Electronics: Lifetime  
Sensors and consumable parts: 1 year

**The answer for gas utilities' gas detection needs**

# Ordering Information

## Battery Chargers

Part No.	Description
494716	Omega 120 VAC 50/60Hz
495965	Omega 220 VAC 50/60Hz
801759	Omega 110/220 VAC, Five Unit, 50/60Hz
800525	Omega 8 - 24VDC for vehicle use

## Battery Packs

Part No.	Description
496990	Standard NiCd Rechargeable
800526	Alkaline, Type C
711041	Alkaline, with Thumbscrews
800527	Heavy Duty NiCd Rechargeable

## Sensors

Part No.	Description
813693	Combustible Gas
480566	O <sub>2</sub>
812389	CO
812390	H <sub>2</sub> S

## Protective Boots

Part No.	Description
804955	Black, for NiCd Battery Packs
802806	Orange, for NiCd Battery Packs
806751	Black, for Alkaline Battery Packs
806750	Orange, for Alkaline Battery Packs
806749	Black, for HD NiCd Battery Packs
806748	Orange, for HD NiCd Battery Packs
812833	Yellow Soft Carrying Case with Harness
711022	Black padded Vinyl Carrying Case with Harness

## Sampling Equipment

Part No.	Description
800332	Probe - 1 ft., plastic
800333	Probe - 3 ft., plastic
803561	Probe - 3 ft., plastic (holes 2" from end) (bar hole probe)
803962	Probe - 3 ft., plastic (holes 2" from handle) (solid probe)
803848	Probe - Hot Gas Sampler
710465	Sampling Line - 5 ft., coiled
497333	Sampling Line - 10 ft.
497334	Sampling Line - 15 ft.
497335	Sampling Line - 25 ft.

## Sampling Accessories

Part No.	Description
801582	Replacement Filter, Probe, pkg. of 10
801291	External Filter Holder
014318	Charcoal Filter
711039	Line Scrubber Filter Holder
711059	Line Scrubber Replacement Cartridges, Box of 12
808935	Dust Filter, Pump Module
802897	Water Trap (Teflon) Filter, Pump Module

## Calibration Check Equipment

Part No.	Description
477149	Calibration Kit Model RP with 0.25 lpm Regulator
491041	Calibration Gas - methane, 2.5%
473180	Calibration Gas - 300 ppm CO
813718	Calibration Gas - methane, 2.5% oxygen, 15% 60 ppm CO
813720	Calibration Gas - methane, 2.5% oxygen, 15% 300 ppm CO 10 ppm H <sub>2</sub> S
710288	Gasmiser™ Demand Regulator 0 - 3.0 lpm

## Accessories

Part No.	Description
804679	Data Docking Module Kit. Includes the Data Docking Module, MSA Link Software and Instruction Manual

# Approvals

The Gasport Gas Tester has been designed to meet intrinsic safety testing requirements in certain hazardous atmospheres.

The Gasport Gas Tester is approved by MET (an OSHA Nationally Recognized Testing Laboratory [NRTL]) for use in Class I, Division I, Groups A, B, C, D; Class II, Division I, Groups E, F, G; and Class III Hazardous locations. Gasport tGas Testers sold in Canada are approved by CSA for use in Class I, Division I, Groups A, B, C, and D locations.

Contact MSA at 1-800-MSA-2222 for more information or with questions regarding the status of approvals.

## Gasport Gas Tester Kits

	LEL Display	O <sub>2</sub>	CO	H <sub>2</sub> S	Alarms Always	Alarms Optional	Leak Detect Page Peak	Alkaline Battery	NiCd Battery	5ft Coiled Line	1ft Probe	Part No.
4-Gas, Selectable, NiCd	•	•	•	•	•	•	•	•	•	•	•	711489
4-Gas, Selectable, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711490
3-Gas, Selectable, NiCd	•	•	•		•	•	•	•	•	•	•	711493
3-Gas, Selectable, Alkaline	•	•	•		•	•	•	•	•	•	•	711494
2-Gas, Selectable, NiCd	•		•		•	•	•	•	•	•	•	711495
2-Gas, Selectable, Alkaline	•		•		•	•	•	•	•	•	•	711496
4-Gas, Alarms On, NiCd	•	•	•	•	•	•	•	•	•	•	•	711491
4-Gas, Alarms On, Alkaline	•	•	•	•	•	•	•	•	•	•	•	711492

## Assemble-to-Order (ATO) System: You Make the Choices

The ATO System makes it easy to "custom order" the Gasport Gas Tester, configured exactly the way you want it. You can choose from an extensive line of base instrument components and accessories. To obtain a copy of the "ATO System and Price Information for the Gasport Gas Tester," call toll-free 1-800-MSA-2222, and request Bulletin 0804-28. To obtain a copy of the ATO via FAX, call MSA QuickLit Information Service at 1-800-672-9010. At the prompt, request QuickLit Document #2345 (ATO for Gasport Gas Tester).

**Note:** This Data Sheet contains only a general description of the products shown. While uses and performance capabilities are described, under no circumstances shall the products be used by untrained or unqualified individuals and not until the product instructions including any warnings or cautions provided have been thoroughly read and understood. Only they contain the complete and detailed information concerning proper use and care of these products.

ID 08-04-27-MC / May 2000  
© MSA 2000 Printed in U.S.A.



**Corporate Headquarters**  
P.O. Box 426  
Pittsburgh, PA 15230 USA  
Phone (412) 967-3000  
www.MSAnet.com

**U.S. Customer Service Center**  
1-800-MSA-2222

**MSA International**  
Phone (412) 967-3354  
FAX (412) 967-3451

**Offices and representatives worldwide**  
For further information:



# GeoXT

## The total GPS platform for all your GIS field requirements

The GeoXT™ handheld, from the GeoExplorer® series, is an essential tool for maintaining your GIS. It's all you need to collect location data, keep existing GIS information up to date, and even mobilize your GIS.

The unique GeoExplorer series combines a Trimble® GPS receiver with a rugged field-ready handheld computer running the Microsoft® Windows Mobile™ 2003 software for Pocket PCs. Plus there's an internal battery that easily lasts for a whole day of GPS operation. The result is tightly integrated, tough, and incredibly powerful.

### High-accuracy integrated GPS

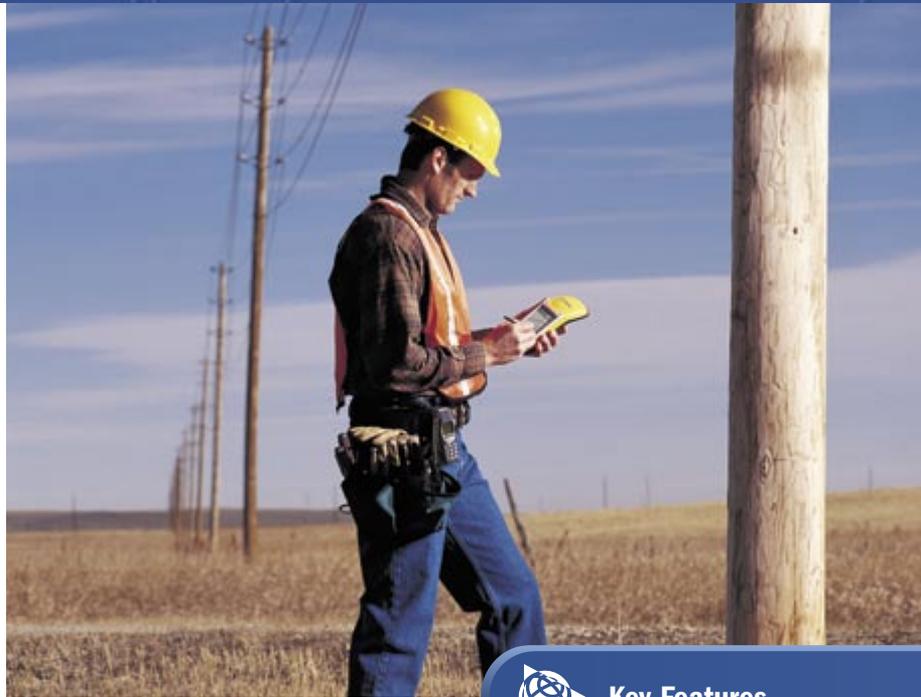
The GeoXT is optimized to provide the reliable, high-accuracy location data you need. Advanced features like EVEREST™ multipath rejection technology let you work under canopy, in urban canyons, or anywhere where accuracy is crucial.

Need submeter accuracy in real-time? Use corrections from a satellite-based augmentation system (SBAS) like WAAS<sup>1</sup> or EGNOS<sup>2</sup>. Want to get that extra edge in precision? Collect data with Trimble's TerraSync™ or GPSCorrect™ software, and then postprocess back in the office.

Because the GPS receiver and antenna are built into the handheld computer, it's never been easier to use GPS in your application. The system is more than just cable-free: it's a totally integrated solution.

### Optimized productivity

Take advantage of the power and flexibility of Windows Mobile software for Pocket PCs by choosing from the most comprehensive range of field software available—whether off-the-shelf or purpose-built. Whatever your needs, Windows



### Key Features

- High-performance submeter GPS with integrated WAAS/EGNOS
- Windows Mobile 2003 software for Pocket PCs, allowing maximum flexibility in software choice
- Rugged handheld with all-day battery
- Advanced color TFT display with backlight
- Integrated Bluetooth for wireless connectivity

Mobile lets you choose a software solution to match your workflow.

Windows Mobile includes familiar Microsoft productivity tools, including Pocket Word, Pocket Excel, and Pocket Outlook®. Pocket Outlook lets you synchronize e-mails, contacts, appointments, and data with your office computer, so whether you're in the office or in the field, you're always up to date.

Go wireless with integrated Bluetooth®\* for connection to other Bluetooth-enabled devices, including cell phones and PCs. You also have the option to use the USB support module to connect to a desktop computer, or use the optional serial clip for cabled connections in the field.

Receive a free copy of Microsoft Streets & Trips\*\* 2004 software with your GeoXT handheld, and take advantage of comprehensive map and travel information for easy navigation and route planning.

### All the memory you need

There's plenty of storage space in the GeoXT for all your GIS data. The fast processor and large memory mean even big graphics files load quickly—and they're crisp and crystal-clear on the advanced TFT outdoor color screen.

From data collection to data maintenance, to mobile GIS and beyond ... the GeoXT is the handheld of choice.

\* Bluetooth type approvals are country specific. GeoExplorer series handhelds are approved for use with Bluetooth in the USA. For a complete list of other countries with Bluetooth approval please refer to: [www.trimble.com/geo\\_bluetooth.html](http://www.trimble.com/geo_bluetooth.html).

\*\* Microsoft Streets & Trips 2004 software available in US/Canada; Microsoft AutoRoute® 2004 in Europe.



## The total GPS platform for all your GIS field requirements

### Standard features

#### System

- Microsoft Windows Mobile 2003 software for Pocket PCs
- 206 MHz Intel StrongARM processor
- 512 MB non-volatile Flash data storage
- Outdoor color display
- Ergonomic cable-free handheld
- Rugged and water-resistant design
- All-day internally rechargeable battery
- Bluetooth wireless

#### GPS

- Submeter accuracy
- Integrated WAAS<sup>1</sup>/EGNOS<sup>2</sup>
- RTCM real-time correction support
- NMEA and TSIP protocol support
- EVEREST multipath rejection technology

#### Software

- GPS Controller for control of integrated GPS and in-field mission planning
- GPS Connector for connecting integrated GPS to external ports
- File Explorer, Internet Explorer, Pocket Outlook (Inbox, Calendar, Contacts, Tasks, Notes), Sprite Pocket Backup, Transcriber, Pocket Word, Pocket Excel, Pictures, Windows<sup>®</sup> Media Player, Bluetooth File Transfer, Calculator, ActiveSync<sup>®</sup>
- Microsoft Streets & Trips/AutoRoute 2004 software

#### Accessories

- Support module with power supply and USB data cable
- Getting Started Guide
- Companion CD includes Outlook 2002 and ActiveSync 3.7.1
- Hand strap
- Pouch
- Stylus

### Optional Features

#### Software

- TerraSync
- GPScorrect for ESRI<sup>®</sup> ArcPad<sup>®</sup>
- GPS Pathfinder<sup>®</sup> Tools Software Development Kit (SDK)
- GPS Pathfinder Office
- Trimble GPS Analyst extension for ArcGIS<sup>®</sup>

#### Accessories

- Serial clip for field data and power input
- Vehicle power adaptor<sup>3</sup>
- Portable power kit<sup>3</sup>
- Hurricane antenna
- External patch antenna
- Pole-mountable ground plane
- Baseball cap with antenna sleeve
- Beacon-on-a-Belt (BoB<sup>™</sup>) differential correction receiver<sup>3</sup>
- Hard carry case
- Null modem cable<sup>3</sup>
- Backpack kit

### Technical specifications

#### Physical

Size	21.5 cm × 9.9 cm × 7.7 cm (8.5 in × 3.9 in × 3.0 in)
Weight	0.72 kg (1.59 lb) with battery
Processor	206 MHz Intel StrongARM SA-1110
Memory	64 MB RAM and 512 MB internal Flash disk
Power	
Low (no GPS)	0.6 Watts
Normal (with GPS)	1.4 Watts
High (with GPS, backlight, and Bluetooth)	2.5 Watts
Battery	Internal lithium-ion, rapidly rechargeable in unit, 21 Watt-hours

#### Environmental

Temperature	
Operating	-10 °C to +50 °C (14 °F to 122 °F)
Storage	-20 °C to +70 °C (-4 °F to 158 °F)
Humidity	.99% non-condensing
Casing	Wind-driven rain and dust-resistant per IP 54 standard Slip-resistant grip, shock- and vibration-resistant

#### Input/output

Communications	Bluetooth for wireless connectivity USB via support module, serial via optional DE9 serial clip adaptor
----------------	--

#### Bluetooth

Certification	Bluetooth type approvals are country specific. GeoExplorer series handhelds are approved for use with Bluetooth in the USA. For a complete list of other countries with Bluetooth approval please refer to <a href="http://www.trimble.com/geoxt_ts.asp">www.trimble.com/geoxt_ts.asp</a> .
---------------	---

#### Profiles

Both client and host support	Serial Port, File Transfer (using OBEX)
Client support only	Dial-Up Networking, Lan Access
Host support only	Basic Imaging, Object Push
Display	Advanced outdoor TFT, 240 × 320 pixel, 65,536 colors, with backlight
Audio	Microphone and half duplex speaker, record and playback utilities
Interface	Anti-glare coated touch screen, Soft Input Panel (SIP) virtual keyboard 2 hardware control keys plus 4 programmable permanent touch buttons
Handwriting recognition software, Audio system events, warnings, and notifications	

#### GPS

Channels	12
Integrated real-time	WAAS <sup>1</sup> or EGNOS <sup>2</sup>
Update rate	1 Hz
Time to first fix	30 sec (typical)
Protocols	NMEA (GGA, VTG, GLL, GSA, ZDA, GSV, RMC), TSIP (Trimble Standard Interface Protocol)

#### Accuracy (RMS)<sup>4</sup> after differential correction

Postprocessed <sup>5</sup>	Submeter
Carrier postprocessed <sup>6</sup>	
With 10 minutes tracking satellites	30 cm
Real-time	Submeter

1 WAAS (Wide Area Augmentation System). Available in North America only.

For more information, see <http://gps.faa.gov/programs/index.htm>.

2 EGNOS (European Geostationary Navigation Overlay System). Available in Europe only.

For more information, see <http://www.esa.int/export/esaSA/navigation.html>.

3 Serial clip also required.

4 Horizontal accuracy. Requires data to be collected with minimum of 4 satellites, maximum PDOP of 6, minimum SNR of 4, minimum elevation of 15 degrees, and reasonable multipath conditions. Ionospheric conditions, multipath signals or obstruction of the sky by buildings or heavy tree canopy may degrade precision by interfering with signal reception. Accuracy varies with proximity to base station by +1 ppm for postprocessing and real-time, and by +5 ppm for carrier postprocessing.

5 Postprocessing with GPS Pathfinder Office software or GPS Analyst extension for ArcGIS.

6 Requires collection of carrier data. (Only available with the GPS Pathfinder Office software).

Specifications subject to change without notice.

#### NORTH & SOUTH AMERICA

Trimble Navigation Limited  
7403 Church Ranch Blvd • Suite 100  
Westminster, CO 80021 • USA  
+1-720-887-4374 Phone • +1-720-887-8019 Fax

#### EUROPE, AFRICA & MIDDLE EAST

Trimble GmbH  
Am Prime Parc 11 • 65479 Raunheim • GERMANY  
+49-6142-2100-0 Phone • +49-6142-2100-550 Fax

#### ASIA-PACIFIC

Trimble Navigation Australia Pty. Ltd  
Level 1 • 123 Gotha St • Fortitude Valley  
Queensland 4006 • AUSTRALIA  
+61-7-3216-0044 Phone • +61-7-3216-0088 Fax



YOUR LOCAL TRIMBLE OFFICE OR REPRESENTATIVE

[www.trimble.com](http://www.trimble.com)



**APPENDIX B**

**GAS SEEP SAMPLE LABORATORY ANALYTICAL REPORT**





Lab #: 116105 Job #: 8353  
 Sample Name/Number: Bouvier  
 Company: Colorado Oil & Gas Conservation  
 Date Sampled: 4/23/2007  
 Container: Cali-5-Bond Bag  
 Field/Site Name: Bouvier/Primero  
 Location:  
 Formation/Depth:  
 Sampling Point:  
 Date Received: 4/26/2007 Date Reported: 4/27/2007

Component	Chemical				
	Chemical mol. %	Air Free vol. %	Delta 13C per mil	Delta D per mil	Delta 15N per mil
Carbon Monoxide -----	nd	nd			
Hydogen Sulfide -----	nd	nd			
Helium -----	nd	nd			
Hydrogen -----	nd	nd			
Argon -----	0.29	0.17			
Oxygen -----	3.32				
Nitrogen -----	20.22	9.32			
Carbon Dioxide -----	0.22	0.26			
Methane -----	75.94	90.24	-55.72	-231.3	
Ethane -----	0.0052	0.0062			
Ethylene -----	nd	nd			
Propane -----	nd	nd			
Iso-butane -----	nd	nd			
N-butane -----	nd	nd			
Iso-pentane -----	nd	nd			
N-pentane -----	nd	nd			
Hexanes + -----	nd	nd			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 770  
 Specific gravity, calculated: 0.660

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100 percent. Mol. % is approximately equal to vol. %

**APPENDIX C**

**PRODUCED WATER GAS SAMPLE LABORATORY ANALYTICAL REPORT**





Lab #: 116434 Job #: 8377  
 Sample Name/Number: Melbourne 21-32 TR Produced water  
 Company: Colorado Oil & Gas Conservation  
 Date Sampled: 4/27/2007  
 Container: Round Plastic Bottle  
 Field/Site Name: Project 1966 Bouvier house explosion  
 Location:  
 Formation/Depth:  
 Sampling Point:  
 Date Received: 5/04/2007 Date Reported: 5/15/2007

Component	Chemical				
	Chemical mol. %	Air Free vol. %	Delta 13C per mil	Delta D per mil	Delta 15N per mil
Carbon Monoxide -----	nd	nd			
Hydogen Sulfide -----	nd	nd			
Helium -----	nd	nd			
Hydrogen -----	nd	nd			
Argon -----	0.21	0.019			
Oxygen -----	4.36				
Nitrogen -----	11.74	nd			
Carbon Dioxide -----	1.28	1.53	1.76		
Methane -----	82.40	98.44	-44.37	-219.9	
Ethane -----	0.012	0.014			
Ethylene -----	nd	nd			
Propane -----	nd	nd			
Iso-butane -----	nd	nd			
N-butane -----	nd	nd			
Iso-pentane -----	nd	nd			
N-pentane -----	nd	nd			
Hexanes + -----	nd	nd			

Total BTU/cu.ft. dry @ 60deg F & 14.7psia, calculated: 835

Specific gravity, calculated: 0.641

Remarks:

Analysis is of gas extracted from water by headspace equilibration. Analysis has been corrected for helium added to create headspace. Helium dilution factor = 0.71  
 CO2 isotopes obtained online via GC-IRMS

nd = not detected. na = not analyzed. Isotopic composition of carbon is relative to VPDB. Isotopic composition of hydrogen is relative to VSMOW. Calculations for BTU and specific gravity per ASTM D3588. Chemical compositions are normalized to 100 percent. Mol. % is approximately equal to vol. %

**APPENDIX D**

**COAL BED METHANE DESORPTION DATA – TRINIDAD MGP WELLS**





RECEIVED

JUL 14 1986

STATE OF COLORADO

COLO. OIL & GAS CONS. COMM.

RICHARD D. LAMM  
GOVERNOR

JOHN W. ROLD  
Director



COLORADO GEOLOGICAL SURVEY  
DEPARTMENT OF NATURAL RESOURCES  
716 STATE CENTENNIAL BUILDING - 1313 SHERMAN STREET  
DENVER, COLORADO 80202 PHONE (303) 839-2811

DESORPTION RESULTS AS OF 8-14-80

Well #	Sample	CGS #	Sample Interval (ft.)	Date Collected	Lost Gas (cu. cm.)	Desorbed Gas (cu. cm.)	Sample Wt. (gm.)	Desorbed Gas (cu. cm.)	(cu. ft./Ton)
2	carb. shale	170	1184-1190	6-22-80	1200	6087	1930	3.78	121
2	coal +	171	1190-1190.75	6-27-80	5600	7757	1644	8.12	260
2	carb. shale	172	1190.75-1191.5	6-27-80	2300	7196	2161	4.39	141
2	coal	173	1205-1209	6-27-80	1500	7707	1017	9.05	290
2	sandstone shale coal	174	1218-1219	6-28-80	450	1134	2356	.67	22
2	shale	175	1219-1219.5	6-28-80	300	1001	1805	.72	23
2	shale	176	1234-1235	6-28-80	300	429	2748	.27	8
3	coal	177	1092.6-1093.6	7-23-80	3300	9537	1475	8.70	278
3	coal	178	1093.6-1094.6	7-23-80	2950	10413	1647	8.11	260
3	coal	179	1099.3-1100.3	7-23-80	3500	10464	1620	8.62	276
3	coal	180	1108-1109	7-25-80	4200	15642	1667	11.90	381
3	coal	181	1157-1158	7-25-80	3050	15709	1670	11.23	359
3	carb. shale	182	1179-1180	7-27-80	Not Calculated	1800	996	1.81	58

Table 2

GEOLOGY  
STORY OF THE PAST . . . KEY TO THE FUTURE

AR

GAS QUALITY - TRINIDAD #3

Component	CGS #177	CGS #179	CGS #180	CGS #181
Methane	92.69 %	93.68 %	95.06 %	96.68 %
Ethane	0.03	0.02	0.02	0.02
Propane	0.00	0.00	0.00	0.00
Isobutane	0.00	0.00	0.00	0.00
Butane	0.00	0.00	0.00	0.00
Pentanes	0.00	0.00	0.00	0.00
Nitrogen	6.96	5.90	4.51	2.92
Carbon Dioxide	0.64	0.36	.40	.38
Heating Value BTU/f+3	938.60	948.40	962.40	978.80

Analyses by C.N. Threlkeld

U. S. Geological Survey 8/6/80

TABLE 4

RECEIVED

JUL 14 1986

COLO. OIL & GAS CONS. COMM

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED



00660817

NOV 1 1986

CGS No. 177

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

APGA & GAS CONS. COMM  
Surface Elev (ft) 6750'  
Coordinates 1614'FWL, 862'FNL

GENERAL

CGS Sample No. 177  
Sampled By D. Boreck  
Operator APGA, Inc.  
Hole No. City of Trinidad #3

Date 7/23/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 101°  
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 2'  
Depth to top of coal 1092.6' (Driller) 1098' (Log)  
Depth to bottom of coal 1094.6' (Driller) 1100' (Log)  
Cored interval 1090.5-1102.5' (Driller)  
Roof description White, med.-gr. ss, w/CaCo3 cement, erosional contact w/coal  
Coal description good cleat in one direction, black  
Floor description gradational contact between coal & black massive carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 1092.6-1093.6' (Driller) 1098-1099' (Log)  
Condition of sample fractured  
Sampled Weight (g) 1475  
Lost gas time (min) 27.5 Lost gas cc 3300  
Desorbed gas cc 10,697 Residual gas cc/g 0.4  
Total gas content cc/g 9.89 Total gas content cf/t 316

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4

## COAL ANALYSES

JUL 14 1986

## COLO. OIL &amp; GAS CONS. COMM.

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

Proximate Analyses (%)

Moisture	.60	N/A	N/A
Volatile Matter	16.73	16.83	25.58
Fixed Carbon	48.69	48.99	74.42
Ash	33.92	34.18	N/A

Ultimate Analyses (%)

Hydrogen	3.47	3.42	5.20
Carbon	57.62	57.97	88.07
Nitrogen	.93	.93	1.42
Sulfur	.43	.43	.65
Oxygen	3.58	3.07	4.66
Ash	33.98	34.18	N/A

Heating value  
(BTU/lb)

10005	10066	15293
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon

DMMF 77.8

Heating Value

BTU/lb MMMF 15830.5

Apparent Rank medium volatile bituminous

Date of Analysis: 3-11-82

Laboratory: U.S. Dept. of Energy

Lab No. L11971

Comments:

GAS ANALYSES

RECEIVED

JUL 14 1986

(MSI percent)

	With air	Air free
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.64	
Nitrogen (plus air)	6.96	
Methane	92.69	
Ethane	.03	
Pentanes	.000	

CALIF. OIL & GAS CONS. COMM.

Calculated gas gravity

--

Calculated gross heating value (BTU/cf)

938.6

Company: A.P.G.A. Sampler: C. M. Tremain  
 Date sample taken: 8-1-80 Date sample analyzed: ?  
 Laboratory: U.S.G.S. Lab No.: CGS 177

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.66

Comments \_\_\_\_\_  
 Laboratory U.S.G.S. Lab No.: CGS 177  
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986

CGS No. 179

~~CGS OIL & GAS COMMISSION~~

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6750'  
Coordinates 1614'FWL, 862'FNL

GENERAL

CGS Sample No. 179  
Sampled By D. Boreck  
Operator APGA, Inc.  
Hole No. City of Trinidad #3

Date 7/24/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 101°  
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 1'  
Depth to top of coal 1099.3' (Driller) 1104.5' (Log)  
Depth to bottom of coal 1100.3' (Driller) 1105.5' (Log)  
Cored interval 1090.5-1102.5' (Driller)  
Roof description interbedded medium-grained sandstone and shale  
Coal description black, highly fractured, pyrite & calcite in fractures  
Floor description gray shale, massive, highly fractured

DESORPTION DATA

Sampled interval (ft) 1099.3-1103.3' (Driller) 1104.5-1105.5' (Log)  
Condition of sample highly fractured  
Sampled Weight (g) 1620  
Lost gas time (min) 22.5 Lost gas cc 3500  
Desorbed gas cc 13617 Residual gas cc/g 0.2  
Total gas content cc/g 10.77 Total gas content cf/t 345

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## COAL ANALYSES

JUL 1 1982

Analyses As Received Moisture and Ash Free

Proximate Analyses (%)

	As Received	Moisture and Ash Free	Moisture and Ash Free
Moisture	.93	N/A	N/A
Volatile Matter	14.08	14.21	29.09
Fixed Carbon	32.32	34.64	70.91
Ash	50.67	51.15	N/A

Ultimate Analyses (%)

Hydrogen	2.87	2.80	5.73
Carbon	42.37	42.77	87.56
Nitrogen	.78	.79	1.61
Sulfur	.34	.35	.71
Oxygen	2.96	2.15	4.41
Ash	50.67	51.15	N/A

Heating value  
(BTU/lb)

As Received	7281	7349	15044
-------------	------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon

DMMF 77.6

Heating Value

BTU/lb MMMF 16110.2

Apparent Rank carb. shale

Date of Analysis: 3-11-82

Laboratory: U.S. Dept. of Energy

Lab No. L11973

Comments:

GAS ANALYSES (see CGS No. 179)

RECEIVED

JUL 14 1986

(MSI percent)

	With air	Air free
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.36	
Nitrogen (+ air)	5.90	
Methane	93.68	
Ethane	.02	
Pentanes	.000	

COLO. OIL & GAS CON. COMM.

Calculated gross heating value (BTU/cf, air free) 948.4

Company: A.P.G.A. Sampler: C. M. Tremain  
Date sample taken: 8-1-80 Date sample analyzed: ?  
Laboratory: U.S.G.S. Lab No.: CGS 179

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -44.50  
Comments \_\_\_\_\_  
Laboratory U.S.G.S. Lab No.: CGS 179  
Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986

CGS No. 181

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

~~COAL~~ OIL & GAS CONS. COMM

Surface Elev (ft) 6750  
Coordinates 862'FNL;1614'FWL

GENERAL

CGS Sample No. 181  
Sampled By D. Boreck  
Operator APGA  
Hole No. City of Trinidad #3

Date 7/25/80  
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Exploration Address Lafayette, Colo.  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 86°F  
TD Hole 1449' Logs Gamma Ray-Density, Resistivity

GEOLOGY

Geologic Unit Vermejo Formation Age Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 1'  
Depth to top of coal 1157' (Driller) 1166' (Log)  
Depth to bottom of coal 1158' (Driller) 1167.5' (Log)  
Cored interval 1154-1160' (Driller)  
Roof description blk mudstone, even bedded, massive, fossiliferous, highly fractured, CaCO3 veins  
Coal description blk, hd, bright, highly fractured, predominantly bright attrital with about 25% vitrinite. Well developed cleats in all directions.  
Floor description fine gr. gray ss interbedded w/mudstone, ss coarsen toward base, vertical fractures

DESORPTION DATA

Sampled interval (ft) 1157-1158' (Driller) 1166.5-1167.5' (Log)  
Condition of sample --  
Sampled Weight (g) 1722  
Lost gas time (min) 26 Lost gas (cc) 3050  
Desorbed gas (cc) 24,472 Residual gas cc/g 0.1  
Total gas content cc/g 16.08 Total gas content cf/t 515

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## COAL ANALYSES

JUL 14 1986

## SOLO OIL &amp; GAS CONS COMM

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

Proximate Analyses (%)

Moisture	.57	N/A	N/A
Volatile Matter	15.59	15.68	23.38
Fixed Carbon	51.08	51.37	76.62
Ash	32.76	32.95	N/A

Ultimate Analyses (%)

Hydrogen	3.43	3.38	5.05
Carbon	59.62	59.97	89.43
Nitrogen	1.00	1.00	1.50
Sulfur	.42	.42	.63
Oxygen	2.77	2.27	3.39
Ash	32.76	32.95	N/A

Heating value

(BTU/lb)

10441	10501	15661
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2570°F
Softening temperature (°F)	2680°F
Fluid temperature (°F)	2770°F

Free Swelling Index	6.5
Fixed Carbon	
DMMF	79.9
Heating Value	
BTU/lb MMMF	16,183
Apparent Rank	low volatile bituminous

Date of Analysis: 5-4-82  
 Laboratory: U.S. Dept. of Energy  
 Comments:

Lab No. L13719

GAS ANALYSES**RECEIVED**

JUL 14 1986

**COLD OIL & GAS CONS. COMM.**(MSI percent)

	<u>With air</u>	<u>Air free</u>
Hydrogen	--	--
Oxygen	--	--
Hydrogen sulfide	--	--
Carbon dioxide	.38	
Nitrogen	2.92	
Methane	96.68	
Ethane	.02	
Other hydrocarbons	--	
<u>Calculated gas gravity</u>	--	

Calculated gross heating value (BTU/cf) 978.8

Company:		Sampler:	Carol Tremain
Date sample taken:	8-1-80	Date sample analyzed:	8-6-80
Laboratory:	U.S.G.S.	Lab No.:	CGS 181

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -44.01

Comments

Laboratory	U.S.G.S.	Lab No.:	CGS 181
Contact	Dudley Rice	Analysis date:	--

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

**RECEIVED**

Company \_\_\_\_\_ Laboratory No. \_\_\_\_\_  
 Date of Analysis \_\_\_\_\_ Petrographer JUL 14 1966  
 Maceral Analyses \_\_\_\_\_  
 of total seam \_\_\_\_\_

**GOLD OIL & GAS CORP. COMPANY**

Vitrinite \_\_\_\_\_ Pseudo Vitrinite \_\_\_\_\_  
 Semi Fusinite \_\_\_\_\_ Semi Macrinite \_\_\_\_\_  
 Fusinite \_\_\_\_\_ Macrinite \_\_\_\_\_  
 Micrinite \_\_\_\_\_ Exinite \_\_\_\_\_  
 Resinite \_\_\_\_\_ % Mean Variation \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Reflectance Analyses

% of total seam \_\_\_\_\_  
 Mean Max Reflectance 1 \_\_\_\_\_ + 0.02  
 Variation \_\_\_\_\_  
 Mean Max Refl. 2 V \_\_\_\_\_ + .02  
 Variation \_\_\_\_\_  
 Mean Max Refl. 2 PV \_\_\_\_\_ + 0.02  
 Variation \_\_\_\_\_  
 Difference RoPV-RoV \_\_\_\_\_

Comments \_\_\_\_\_  
 \_\_\_\_\_

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986

CGS No. 180

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

WELL OR GAS CONS. COMM.

Surface Elev (ft) 6750  
Coordinates 1614'FWL, 862'FNL

GENERAL

CGS Sample No. 180  
Sampled By D. Boreck  
Operator APGA, Inc.  
Hole No. City of Trinidad #3

Date 7/23/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 68°F  
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 1'  
Depth to top of coal 1108' (Driller) 1113.5' (Log)  
Depth to bottom of coal 1109' (Driller) 1114.5' (Log)  
Cored interval 1102.5-1122' (Driller)  
Roof description black carbonaceous shale with vitrain stringers  
Coal description black, highly fractured, CaCO3 in cleats

Floor description gray, sandy mudstone, poorly sorted, flat bedding, CaCO3 along fractures and bedding planes

DESORPTION DATA

Sampled interval (ft) 1108-1109 (Driller) 1113.5-1114.5' (Log)  
Condition of sample highly fractured, foaming  
Sampled Weight (g) 1724  
Lost gas time (min) 25 Lost gas cc 4200  
Desorbed gas cc 17226 Residual gas cc/g .5  
Total gas content cc/g 12.93 Total gas content cf/t 414

Miscellaneous

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

JUL 14 1986

COAL ANALYSESCOLD OIL & GAS CONS. COMM.

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.73	N/A	N/A
Volatile Matter	17.36	17.49	23.02
Fixed Carbon	58.05	58.48	76.98
Ash	23.86	24.03	N/A

Ultimate Analyses (%)

Hydrogen	3.91	3.86	5.08
Carbon	66.63	67.12	88.35
Nitrogen	1.01	1.02	1.34
Sulfur	.44	.44	.58
Oxygen	4.15	3.52	4.64
Ash	23.86	24.03	N/A

Heating value  
(BTU/lb)

11610	11695	15395
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2830
Softening temperature (°F)	2910
Fluid temperature (°F)	2910

Free Swelling Index	4.0
---------------------	-----

Fixed Carbon	
DMMF	79.15

Heating Value	
BTU/lb DMMF	15,661.74

Apparent Rank	lv bituminous
---------------	---------------

Date of Analysis:	2-21-82
-------------------	---------

Laboratory:	U.S. Dept. of Energy
-------------	----------------------

Lab No.	L11663
---------	--------

Comments:	
-----------	--

GAS ANALYSES**RECEIVED****JUL 14 1980**(MSI percent)

	<u>With air</u>	<u>Air free</u>
Propane	.000	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	.40	
Nitrogen	4.51	
Methane	95.06	
Ethane	.02	
Pentanes	.000	

COLO. OIL &amp; GAS COMS. CO.

Calculated gas gravity --Calculated gross heating value (BTU/cf) 962.4

Company: APGA Sampler: C. M. Tremain  
 Date sample taken: 8-1-80 Date sample analyzed: ?  
 Laboratory: USGS Lab No.: CGS 180

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -44.80

Comments \_\_\_\_\_  
 Laboratory U.S. Geol. Survey Lab No.: CGS 180  
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

GAS QUALITY - TRINIDAD #2

Component	CGS 170	CGS 171	CGS 172	CGS 173
Methane	91.29 %	93.89 %	93.78 %	92.04 %
Ethane	1.02	0.075	0.025	.15
Propane	0.46	0.055	0.010	0.000
Isobutane	0.027	0.006	0.000	0.000
Butane	0.024	0.002	0.000	0.000
Pentane	0.000	0.000	0.000	0.000
Nitrogen	6.09	4.82	5.03	6.23
Carbon Dioxide	0.78	1.12	1.14	1.71
Heating Value	955.6	953.2	949.8	934.1

BTU/ft<sup>3</sup>

Analyses by C. N. Threlkeld

U. S. Geological Survey 8/6/80

RECEIVED

JUL 14 1986

COLD. OIL & GAS CONS. COMM

TABLE 3

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1980

CGS No. 170

LOCATION **COLO. OIL & GAS COMMISSION**

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 170  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6/22/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 103°F  
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature,  
Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 1'  
Depth to top of coal 1184' (Driller) ? (Log)  
Depth to bottom of coal 1185' (Driller) ? (Log)  
Cored interval 1184-1190' (Driller)  
Roof description shale  
Sample description carbonaceous shale w/trace sandstone & coal  
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1184-1185 (Driller) ? (Log)  
Condition of sample dirty, fractured, wet  
Sampled Weight (g) 1933  
Lost gas time (min) 47.5 Lost gas cc 1200  
Desorbed gas cc 6531 Residual gas cc/g 0.1  
Total gas content cc/g 4.10 Total gas content cf/t 131

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RECEIVED MAR 21 1983

COAL ANALYSES

**RECEIVED**

JUL 14 1986

Analyses                      As Received      Moisture Free      Moisture and Ash Free

**COAL OIL & GAS CONS. COMM.**

Proximate Analyses (%)

Moisture	1.06	N/A	N/A
Volatile Matter	12.32	12.45	29.71
Fixed Carbon	29.15	29.46	70.29
Ash	57.47	58.09	N/A

Ultimate Analyses (%)

Hydrogen	2.54	2.44	5.83
Carbon	35.83	36.22	86.41
Nitrogen	.62	.62	1.49
Sulfur	.28	.28	.68
Oxygen	3.27	2.35	5.60
Ash	57.47	58.09	N/A

Heating value  
(BTU/lb)

6184	6251	14914
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2640
Softening temperature (°F)	2730
Fluid temperature (°F)	2840

<u>Free Swelling Index</u>	1.0
<u>Fixed Carbon</u>	
DMMF	79.27
<u>Heating Value</u>	
BTU/lb DMMF	16,332.08
<u>Apparent Rank</u>	carbonaceous shale

Date of Analysis: 2-21-82  
 Laboratory: U.S. Dept. of Energy                      Lab No. L11684  
 Comments: \_\_\_\_\_



COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

NEGATIVE

JUL 4 1983 CGS No. 171

LOCATION

COLO. OIL & GAS CONS. COMM.

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 171  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6/27/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 90°F

Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness .75'  
Depth to top of coal 1190' (Driller) ? (Log)  
Depth to bottom of coal 1190.75' (Driller) ? (Log)  
Cored interval 1188-1199' (Driller)  
Roof description shale  
Coal description black, dull coal, carb. shale?, desceminated pyrite  
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1190-1190.75' (Driller) ? (Log)  
Condition of sample very fractured, bubbly  
Sampled Weight (g) 1653  
Lost gas time (min) 45 Lost gas cc 5600  
Desorbed gas cc 8247 Residual gas cc/g 0.1  
Total gas content cc/g 8.48 Total gas content cf/t 271

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## COAL ANALYSES

JUL 14 1986

## COLO. OIL &amp; GAS CONS. COMM.

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

Proximate Analyses (%)

Moisture	1.50	N/A	N/A
Volatile Matter	11.79	11.97	30.20
Fixed Carbon	27.26	27.68	69.80
Ash	59.45	60.35	N/A

Ultimate Analyses (%)

Hydrogen	2.29	2.16	5.44
Carbon	33.72	34.24	86.36
Nitrogen	.58	.59	1.49
Sulfur	.27	.27	.69
Oxygen	3.69	2.39	6.02
Ash	59.45	60.35	N/A

Heating value  
(BTU/lb)

As Received	5666	5752	14509
-------------	------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2630
Softening temperature (°F)	2740
Fluid temperature (°F)	2830

Free Swelling Index	1.0
---------------------	-----

Fixed Carbon	
DMMF	79.72

Heating Value	
BTU/lb DMMF	15,857.54

Apparent Rank	carbonaceous shale
---------------	--------------------

Date of Analysis:	2-21-82
-------------------	---------

Laboratory:	U.S. Dept. of Energy
-------------	----------------------

Lab No.	L11641
---------	--------

Comments:	
-----------	--

GAS ANALYSES

RECEIVED

JUL 14 1986

(MSI percent)

	<u>With air</u>	<u>Air free</u>
Propane	.055	
Isobutane	.006	
n-Butane	.002	
Carbon dioxide	1.12	
Nitrogen (or air)	4.82	
Methane	93.89	
Ethane	.075	
Pentanes	.000	

~~OLD OIL & GAS CONS. DIV.~~Calculated gas gravity --Calculated gross heating value (BTU/cf) 953.2

Company: A.P.G.A. Sampler: Colorado Geological Survey  
 Date sample taken: 7-8-80 Date sample analyzed: ?  
 Laboratory: U.S. Geol. Survey Lab No.: CGS 171

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -45.22

Comments

Laboratory U.S. Geological Survey Lab No.: CGS 171  
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

JUL 14 1986 CGS No. 172

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

COLO. OIL & GAS CONS. COMM.

Surface Elev (ft) 6770'  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 172  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6-27-80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 90°F  
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temp., Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed unnamed Bed Thickness 1.5'  
Depth to top of coal 1190' (Driller) ? (Log)  
Depth to bottom of coal 1191.5' (Driller) ? (Log)  
Cored interval 1188-1199' (Driller)  
Roof description shale  
Coal description carbonaceous shale, waxy luster, pyrite, calcite in fractures  
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1190.75-1191.5' (Driller) ? (Log)  
Condition of sample fractured, crumbly, bubbly  
Sampled Weight (g) 2161  
Lost gas time (min) 45 Lost gas cc 2300  
Desorbed gas cc 8147 Residual gas cc/g 0.1  
Total gas content cc/g 4.93 Total gas content cf/t 158

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

JUL 14 1968

COAL ANALYSES

GOLD OIL &amp; GAS CONS. COM.

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

Proximate Analyses (%)

Moisture	1.21	N/A	N/A
Volatile Matter	11.14	11.38	36.89
Fixed Carbon	19.06	19.29	63.11
Ash	68.59	69.43	N/A

Ultimate Analyses (%)

Hydrogen	1.87	1.75	5.74
Carbon	24.45	24.75	80.98
Nitrogen	.43	.44	1.43
Sulfur	.24	.24	.80
Oxygen	4.42	3.38	11.07
Ash	68.59	69.43	N/A

Heating value  
(BTU/lb)

4111	4161	13613
------	------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
---------------------	---------

Fixed Carbon

DMMF	77.4
------	------

Heating Value

BTU/lb MMMF	15893
-------------	-------

Apparent Rank	carb. shale
---------------	-------------

Date of Analysis: 3-11-82

Laboratory: U.S. Dept. of Energy

Lab No. L11974

Comments:

GAS ANALYSES

RECEIVED

JUL 14 1986

~~COLO. GEOLOGICAL SURVEY~~(MSI percent)

	<u>With air</u>	<u>Air free</u>
Propane	.010	
Isobutane	.000	
n-Butane	.000	
Carbon dioxide	1.14	
Nitrogen (or air)	5.03	
Methane	93.78	
Ethane	.025	
Pentanes	.000	

Calculated gas gravity --Calculated gross heating value (BTU/cf) 949.8

Company: A.P.G.A. Sampler: Colorado Geological Survey  
 Date sample taken: 7-8-80 Date sample analyzed: ?  
 Laboratory: U.S.G.S. Lab No.: CGS 172

Carbon Isotope Ratio (relative to Chicago standard)C13 (ppm) -45.17

Comments \_\_\_\_\_

Laboratory U.S.G.S. Lab No.: CGS 172  
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986 CGS No. 173

LOCATION

COLO. OIL & GAS CONS. COMM.

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 173  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6-27-80  
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 74°F  
TD Hole 1448.6' Logs gamma, caliper, resistivity, density, temp.,  
coal quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed unnamed Bed Thickness 4'  
Depth to top of coal 1205' (Driller) ? (Log)  
Depth to bottom of coal 1209' (Driller) ? (Log)  
Cored interval 1199-1209' (Driller)  
Roof description shale w/ ss stringers  
Coal description dull, carb. shale?  
Floor description intermixed ss & shale

DESORPTION DATA

Sampled interval (ft) 1205-1209 (Driller) ? (Log)  
Condition of sample crumbly, wet, random sample  
Sampled Weight (g) 1048  
Lost gas time (min) 21.5 Lost gas cc 1500  
Desorbed gas cc 9887 Residual gas cc/g 0.5  
Total gas content cc/g 11.37 Total gas content cf/t 364

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COAL ANALYSES

JUL 14 1986

W.D. GIL & GAS CONS. COMM.

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
-----------------	--------------------	----------------------	------------------------------

Proximate Analyses (%)

Moisture	.99	N/A	N/A
Volatile Matter	13.92	14.06	25.80
Fixed Carbon	40.05	40.45	74.20
Ash	45.04	45.49	N/A

Ultimate Analyses (%)

Hydrogen	2.95	2.87	5.26
Carbon	47.32	47.80	87.60
Nitrogen	.77	.78	1.43
Sulfur	.32	.32	.59
Oxygen	3.60	2.75	5.04
Ash	45.04	45.49	N/A

Heating value  
(BTU/lb)

81.92	82.74	15179
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index	not run
---------------------	---------

Fixed Carbon

DMMF	79.7
------	------

Heating Value

BTU/lb MMMF	15974.7
-------------	---------

Apparent Rank	low volatile bituminous
---------------	-------------------------

Date of Analysis: 3-11-82

Laboratory: U.S. Dept. of Energy

Lab No. L11975

Comments:

RECEIVED

JUL 14 1986

COLO. OIL &amp; GAS CONS. COMM.

## GAS ANALYSES

	With air	Air free
(MSI percent)		
Propane	.000	
Isobutane	.000	
n-butane	.000	
Carbon dioxide	1.71	
Nitrogen	6.23	
Methane	92.04	
Ethane	.15	
Pentanes	.000	
Calculated gas gravity	--	

Calculated gross heating value (BTU/cf, air free) 934.1

Company: A.P.G.A. Sampler: Colorado Geol. Survey  
 Date sample taken: 7-8-80 Date sample analyzed: ?  
 Laboratory: U.S.G.S. Lab No.: CGS #173

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm) -45.60

Comments

Laboratory U.S.G.S. Lab No.: CGS 173  
 Contact Dudley Rice Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

RECEIVED

JUL 14 1986

CGS No. 178

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

COLORADO OIL & GAS CONS. COM.

Surface Elev (ft) 6750'  
Coordinates 1614'FWL, 862'FNL

GENERAL

CGS Sample No. 178  
Sampled By D. Boreck  
Operator APGA, Inc.  
Hole No. City of Trinidad #3

Date 7/23/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 101°  
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 2'  
Depth to top of coal 1092.6' (Driller) 1098' (Log)  
Depth to bottom of coal 1094.6' (Driller) 1100' (Log)  
Cored interval 1090.5-1102.5' (Driller)  
Roof description white, med.-gr. ss w/CaCO3 cement, erosional contact w/coal  
Coal description black, fractured, carbonaceous shale ?  
Floor description gradational contact between coal & black massive carbonaceous shale

DESORPTION DATA

Sampled interval (ft) 1093.6-1094.6' (Driller) 1099-1100' (Log)  
Condition of sample fractured  
Sampled Weight (g) 1655  
Lost gas time (min) 27.5 Lost gas cc 2950  
Desorbed gas cc 13,404 Residual gas cc/g 0.7  
Total gas content cc/g 10.58 Total gas content cf/t 339

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

## COAL ANALYSES

JUL 14 1986

~~OHIO OIL & GAS CORP. DUNN~~

Analyses As Received Moisture Free Moisture and Ash Free

Proximate Analyses (%)

Moisture	.56	N/A	N/A
Volatile Matter	16.19	16.28	23.69
Fixed Carbon	52.14	52.44	76.31
Ash	31.11	31.28	N/A

Ultimate Analyses (%)

Hydrogen	3.53	3.49	5.07
Carbon	60.01	60.35	87.82
Nitrogen	.88	.89	1.29
Sulfur	.39	.39	.57
Oxygen	4.09	3.61	5.25
Ash	31.11	31.28	N/A

Heating value  
(BTU/lb)

10450 10509 15293

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon  
DMMF 79.4Heating Value  
BTU/lb MMMF 15759.2Apparent Rank low volatile bituminous

Date of Analysis: 3-11-82

Laboratory: U.S. Dept. of Energy

Lab No. L11972

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

PL. 1183 CONS. COMM.

Surface Elev (ft) 6750  
Coordinates 1614'FWL, 862'FNL

GENERAL

CGS Sample No. 182  
Sampled By D. Boreck  
Operator APGA, Inc.  
Hole No. City of Trinidad #3

Date 7/27/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval Conventional  
Drilling media Mud Air Temperature 85°F  
TD Hole 1449' Logs Resistivity, Gamma, L.S. Density, Caliper

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed unnamed Bed Thickness ?  
Depth to top of zone ? (Driller) ? (Log)  
Depth to bottom of zone ? (Driller) ? (Log)  
Cored interval 1179-1186' (Driller)  
Roof description same as sample  
Sample description highly fractured black carbonaceous mudstone-shale, aa.  
Floor description same

DESORPTION DATA

Sampled interval (ft) 1179-1180 (Driller) ? (Log)  
Condition of sample 6", partially fractured, fizzing  
Sampled Weight (g) 989  
Lost gas time (min) not calculated Lost gas cc not calculated  
Desorbed gas cc 1800 Residual gas cc/g 0.1  
Total gas content cc/g 1.92 Total gas content cf/t 61

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COAL ANALYSES

JUL 1, 4 1986

Analyses	As Received	Moisture Free	ASH FREE
----------	-------------	---------------	----------

Proximate Analyses (%)

Moisture	2.65	N/A	N/A
Volatile Matter	8.40	8.63	45.64
Fixed Carbon	10.01	10.29	54.36
Ash	78.94	81.08	N/A

Ultimate Analyses (%)

Hydrogen	1.59	1.33	7.02
Carbon	13.80	14.18	74.94
Nitrogen	.30	.31	1.65
Sulfur	.18	.18	.97
Oxygen	5.19	2.91	15.40
Ash	78.94	81.08	N/A

Heating value

( TU/1b)

1873

1924

10171

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	not run
Softening temperature (°F)	not run
Fluid temperature (°F)	not run

Free Swelling Index not run

Fixed Carbon

DMMF 83.22

Heating Value

BTU/1b MMMF 12,727

Apparent Rank carbonaceous shale

Date of Analysis: 2-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11686

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

RECEIVED

JUL 14 1986

CGS No. 183

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

~~2010~~ OIL & GAS CONS. COMM

Surface Elev (ft) 6771  
Coordinates 1100'FWL, 946'FNL

GENERAL

CGS Sample No. 183  
Sampled By C. Tremain  
Operator APGA, Inc.  
Hole No. City of Trinidad #1

Date 9-23-80  
Sample Type slotting sample

DRILLING DATA

Drilling Co. Pride Oil Well Serv. Co. Address Brighton, Colo.  
Core Size --- Barrel Length ---  
Type of core retrieval chips from mud  
Drilling media water Air Temperature 80°  
TD Hole 1606 Logs Gamma, L.S. Density, B.R. Density, Caliper,  
Temperature, SP-Resistivity

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness 4.5'  
Depth to top of coal 1360' (Driller) 1356.5' (Log)  
Depth to bottom of coal 1363' (Driller) 1360' (Log)  
Cored interval --- (Driller)  
Roof description Sandstone  
Coal description black, small pieces from slotting  
Floor description siltstone or silty shale

DESORPTION DATA

Sampled interval (ft) 1360-1363 (Driller) 1356.5-1360 (Log)  
Condition of sample small pieces  
Sampled Weight (g) 721  
Lost gas time (min) not calculated Lost gas cc not calculated  
Desorbed gas cc 8874 Residual gas cc/g .4  
Total gas content cc/g 12.71 Total gas content cf/t 407

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COAL ANALYSES

JUL 4 1982

COLO. OIL & GAS CONS. COM. INC.

Analyses As Received Moisture Free Moisture and Ash Free

Proximate Analyses (%)

Moisture	.39	N/A	N/A
Volatile Matter	18.87	18.94	22.36
Fixed Carbon	65.52	65.78	77.64
Ash	15.22	15.28	N/A

Ultimate Analyses (%)

Hydrogen	4.40	4.37	5.16
Carbon	75.76	76.06	69.79
Nitrogen	1.25	1.25	1.48
Sulfur	.57	.57	.67
Oxygen	2.80	2.46	2.90
Ash	15.22	15.28	N/A

Heating value  
(BTU/lb)

13244	13296	15695
-------	-------	-------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2740
Softening temperature (°F)	2860
Fluid temperature (°F)	2910

Free Swelling Index 8.5

Fixed Carbon  
DMMF 78.97

Heating Value  
BTU/lb MMMF 15,874

Apparent Rank lv bituminous

Date of Analysis: 8-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11694

Comments:

GAS ANALYSES

RECEIVED

<u>(MSI percent)</u>	<u>With air</u> <u>Air free</u>	
	Propane	0.01
Isobutane	--	
n Butane	--	
Carbon dioxide	0.12	
Nitrogen + air	2.04	
Methane	97.82	
Ethane	0.02	
Pentanes	--	
<u>Calculated gas gravity</u>		

Calculated gross heating value (BTU/cf)      990.6

Company: A.P.G.A.      Sampler: Colorado Geol. Survey  
 Date sample taken: 9-30-80      Date sample analyzed: \_\_\_\_\_  
 Laboratory: U.S. Geol. Survey      Lab No.: J-2 (Raton Basin)

Carbon Isotope Ratio (relative to Chicago standard)

C13 (ppm)      -43.52  
 Comments \_\_\_\_\_  
 Laboratory U.S. Geol. Survey      Lab No.: J-2 (Raton Basin)  
 Contact Dudley Rice      Analysis date: ?

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES

Company C.T. & E.      Laboratory No. Trinidad #1

MACERAL ANALYSIS  
(Volume Percent)

(Mineral-Matter Free Basis)

<u>MACERAL</u>		<u>MACERAL GROUP</u>	
Vitrinite	79.5	Vitrinite	81.2
Pseudovitrinite	1.8		
Exinite	0.0	Exinite	0.0
Resinite	0.0	(Liptinite)	
Semi-Fusinite	12.6		
Semi-Macrinite	0.4		
Fusinite	3.1	Inertinite	18.7
Macrinite	0.3		
Micrinite	2.3		
<b>TOTAL:</b>	<b>100</b>		<b>100%</b>

Based on 1000 point counts

REFLECTANCE ANALYSIS

Mean-MNaximum Vitrinite Ro- 1.39

V-Type Table for Vitrinites (=100%)

<u>V-12</u>	<u>V-13</u>	<u>V-14</u>	<u>V-</u>
1	56	43	

**RECEIVED**

**JUL 14 1986**

**COAL OIL & GAS CONS. COMM**

RECEIVED

JUL 14 1986

COLO. OIL & GAS CONS. COMM

GAS QUALITY ANALYSIS

A small quantity of gas was collected from each sample canister by the Colorado Geological Survey. These samples were analyzed for methane as well as other components listed in Table 3. In addition, each sample was evaluated for heating value in B.T.U./ft.<sup>3</sup>

The results of these tests are listed in Tables 3 & 4, pages 38 & 39. All coal samples analyzed proved to have excellent methane content (91.29% - 96.68%) and B.T.U. ratings (934.10 - 978.80).

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986 CGS No. 174

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

COLO. OIL & GAS CONS. COMM.

Surface Elev (ft) 6770  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 174  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6-28-80  
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colo.  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 84°F  
TD Hole 1448.6' Logs gamma, caliper, resistivity, density, temp.,  
coal quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness ?  
Depth to top of zone ? (Driller) ? (Log)  
Depth to bottom of zone ? (Driller) ? (Log)  
Cored interval 1208-1228' (Driller)  
Roof description shale  
Sample description shale, carbonaceous, fissile, fine vitrinite bands,  
CaCO3 veins  
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1218-1219 (Driller) ? (Log)  
Condition of sample hard, slightly fractured  
Sampled Weight (g) 2398  
Lost gas time (min) 25 Lost gas cc 400  
Desorbed gas cc 1226 Residual gas cc/g 0.1  
Total gas content cc/g .78 Total gas content cf/t 25

Miscellaneous carbonaceous shale

COAL ANALYSES - not run

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986

CGS No. 175

LOCATION

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

COLO. OIL & GAS CONS. COM. X

Surface Elev (ft) 6770  
Coordinates 965'FWL; 502'FNL

GENERAL

CGS Sample No. 175  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6-28-80  
Sample Type core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval conventional  
Drilling media mud Air Temperature 54°  
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature, Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Coal zone/bed uncorrelated Bed Thickness \_\_\_\_\_  
Depth to top of zone ? (Driller) ? (Log)  
Depth to bottom of zone ? (Driller) ? (Log)  
Cored interval 1208-1228' (Driller)  
Roof description shale  
Sample description carbonaceous shale, fissile, fine vitrinite bands, CaCO3 veins  
Floor description shale

DESORPTION DATA

Sampled interval (ft) 1219-1219.5 (Driller) ? (Log)  
Condition of sample hard, slightly fractured  
Sampled Weight (g) 1812  
Lost gas time (min) 28 Lost gas cc 300  
Desorbed gas cc 1188 Residual gas cc/g 0.0  
Total gas content cc/g .82 Total gas content cf/t 26

Miscellaneous carbonaceous shale

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

RECEIVED

CGS No. 175

COAL ANALYSES

JUL 14 1986

Analyses	As Received	Moisture Free	Moisture and Ash Free
----------	-------------	---------------	-----------------------

GOLD, OIL &amp; GAS CONS. COMM.

Proximate Analyses (%)

Moisture	3.36	N/A	N/A
Volatile Matter	6.71	6.95	73.46
Fixed Carbon	2.42	2.51	26.54
Ash	87.51	90.54	N/A

Ultimate Analyses (%)

Hydrogen	1.17	.82	8.71
Carbon	5.02	5.19	54.88
Nitrogen	.17	.17	1.83
Sulfur	.21	.22	2.31
Oxygen	5.93	3.05	32.35
Ash	87.51	90.54	N/A

Heating value  
(BTU/lb)

622	643	6804
-----	-----	------

Sulfur Forms (%)

Sulfate	not run
Pyritic	not run
Organic	not run

Ash

Initial deformation (°F)	2630
Softening temperature (°F)	2720
Fluid temperature (°F)	2810

Free Swelling Index 0.0

Fixed Carbon  
DMMF 118.61Heating Value  
BTU/lb MMMF 11379

Apparent Rank carbonaceous shale

Date of Analysis: 2-21-82

Laboratory: U.S. Dept. of Energy

Lab No. L11699

Comments:

GAS ANALYSES - not runADSORPTION ISOTHERM DATA - not runPETROGRAPHIC ANALYSES - not run

COAL BED METHANE DESORPTION DATA  
OPEN FILE REPORT 81-4

RECEIVED

JUL 14 1986

CGS No. 176

LOCATION COLO. OIL & GAS CONS. COMML

County: Las Animas  
Location: Sec 32 Twp 33S Rge 66W

Surface Elev (ft) 6770  
Coordinates 502' FNL; 965' FWL

GENERAL

CGS Sample No. 176  
Sampled By Rebecca Owen  
Operator APGA, Inc.  
Hole No. City of Trinidad #2

Date 6/28/80  
Sample Type Core

DRILLING DATA

Drilling Co. Ormsbee Drilling Co. Address Lafayette, Colorado  
Core Size 3" Barrel Length 20'  
Type of core retrieval Conventional  
Drilling media Mud Air Temperature ?  
TD Hole 1448.6' Logs Gamma, Caliper, Resistivity, Density, Temperature, Coal Quality

GEOLOGY

Geologic Unit Vermejo Formation Age Upper Cretaceous  
Sample zone unnamed Bed Thickness ?  
Depth to top of zone ? (Driller) ? (Log)  
Depth to bottom of zone ? (Driller) ? (Log)  
Cored interval 1235-1241.5' (Driller)  
Roof description ?  
Sample description Carbonaceous shale with slickensides and a fine grained, gray sandstone lens  
Floor description ?

DESORPTION DATA

Sampled interval (ft) 1234-1235 (Driller) ? (Log)  
Condition of sample several large pieces  
Sampled Weight (g) 2748  
Lost gas time (min) 31.5 Lost gas cc 300  
Desorbed gas cc 429 Residual gas cc/g 0.1  
Total gas content cc/g .37 Total gas content cf/t 12

Miscellaneous \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

COAL ANALYSES

<u>Analyses</u>	<u>As Received</u>	<u>Moisture Free</u>	<u>Moisture and Ash Free</u>
<u>Proximate Analyses (%)</u>			
Moisture	2.54	N/A	N/A
Volatile Matter	4.94	5.07	91.63
Fixed Carbon	.45	.47	8.37
Ash	92.07	94.46	N/A
<u>Ultimate Analyses (%)</u>			
Hydrogen	.95	.68	12.33
Carbon	2.51	2.58	46.53
Nitrogen	.13	.13	2.42
Sulfur	.06	.06	1.09
Oxygen	4.28	2.08	37.55
Ash	92.07	94.46	N/A
<u>Heating value</u> (BTU/lb)	238	245	4418
<u>Sulfur Forms (%)</u>			
Sulfate	not run		
Pyritic	not run		
Organic	not run		
<u>Ash</u>			
Initial deformation (°F)	not run		
Softening temperature (°F)	not run		
Fluid temperature (°F)	not run		
<u>Free Swelling Index</u>	not run		
<u>Fixed Carbon</u>			
<u>DMMF</u>	--		
<u>Heating Value</u>			
<u>BTU/lb MMMF</u>	--		
<u>Apparent Rank</u>	carbonaceous shale		
Date of Analysis:	2-21-82		
Laboratory:	U.S. Dept. of Energy		Lab No. L11685
Comments:			

GAS ANALYSES - not run

ADSORPTION ISOTHERM DATA - not run

PETROGRAPHIC ANALYSES - not run

**APPENDIX E**  
**WATER WELL CONSTRUCTION AND TEST REPORTS**



**COLORADO DIVISION OF WATER RESOURCES**  
**DEPARTMENT OF NATURAL RESOURCES**  
 1313 SHERMAN ST., RM 818, DENVER, CO 80203  
 phone - info: (303) 866-3587 main: (303) 866-3581  
 fax: (303) 866-3588 http://www.water.state.co.us

Office Use Only

Form GWS-44 (8/2006)

RECEIVED

AUG 19 2004

WATER IN THE STATE ENGINEERING COLD

**RESIDENTIAL** Note: Also use this form to apply for livestock watering

**Water Well Permit Application**

Review instructions on reverse side prior to completing form. The form must be completed in black ink.

**1. Applicant Information**

Name of applicant  
Stephen R. Bouvier  
Audrey F. Bouvier

Mailing address  
69 Azalea Drive

City State Zip code  
Harwich MA 02645

Telephone #  
(508) 432-6171

**2. Type Of Application (check applicable boxes)**

- Construct new well
- Replace existing well
- Change source (aquifer)
- Other:
- Use existing well
- Change or increase use
- Reapplication (expired permit)

**3. Refer To (if applicable)**

Well permit # \_\_\_\_\_ Water Court case # \_\_\_\_\_  
Designated Basin Determination # \_\_\_\_\_ Well name or # \_\_\_\_\_

**4. Location Of Proposed Well**

County: Las Animas NW 1/4 of the NW 1/4  
Section: 32 Township: 33 N or S:  N  S Range: 66 E or W:  E  W Principal Meridian: 6 th

Distance of well from section lines (section lines are typically not property lines)  
950 ft. from  N  S 1000 ft. from  E  W

For replacement wells only - distance and direction from old well to new well  
feet direction

Well location address (if applicable)

Optional: GPS well location information in UTM format  
Required settings for GPS units are as follows:

Format must be UTM  
Zone must be 12  
Units must be Meters  
Datum must be NAD27 (CONUS)  
Unit must be set to true north  
Were points averaged?  YES  NO

Nothing

Easting

**6. Use Of Well (check applicable boxes)**

- See instructions to determine use(s) for which you may qualify
- A. Ordinary household use in one single-family dwelling (no outside use)
- B. Ordinary household use in 1 to 3 single-family dwellings:  
Number of dwellings: 1
- Home garden/lawn irrigation, not to exceed one acre:  
area irrigated 1 sq. ft.  acre
- Domestic animal watering - (non-commercial)
- C. Livestock watering (on farm/ranch/range/pasture)

**7. Well Data (proposed)**

Maximum pumping rate \_\_\_\_\_ gpm Annual amount to be withdrawn \_\_\_\_\_ acre-feet  
Total depth \_\_\_\_\_ feet Aquifer \_\_\_\_\_

**8. Water Supplier**

Is this parcel within boundaries of a water service area?  YES  NO If yes, provide name of supplier.

**9. Type Of Sewage System**

- Septic tank / absorption leach field
- Central system: District name: \_\_\_\_\_
- Vault: Location sewage to be hauled to: \_\_\_\_\_
- Other (attach copy of engineering design and report)

**10. Proposed Well Driller License #(optional):**

**11. Signature Of Applicant(s) Or Authorized Agent**

The making of false statements herein constitutes perjury in the second degree, which is punishable as a class 1 misdemeanor pursuant to C.R.S. 24-104 (13)(a). I have read the statements herein, know the contents thereof and state that they are true to my knowledge.

Sign (sign must be original signature) Date  
Stephen R. Bouvier 08/06/04  
Audrey F. Bouvier  
Print name & title  
STEPHEN R + AUDREY F. BOUVIER / OWNERS

**5. Parcel On Which Well Will Be Located**

A. You must check and complete one of the following:

- Subdivision: Name  
Lot \_\_\_\_\_ Block \_\_\_\_\_ Filing/Unit \_\_\_\_\_
- County exemption (attach copy of county approval & survey):  
Name# \_\_\_\_\_ Lot # \_\_\_\_\_
- Parcel less than 35 acres, not in a subdivision, attach a deed with metes and bounds description recorded prior to June 1, 1972
- Mining claim (attach a copy of the deed or survey): Name# \_\_\_\_\_
- Square 40 acre parcel as described in Item 4
- Parcel of 35 or more acres (attach a metes and bounds description or survey)
- Other (attach metes & bounds description or survey and supporting documents)

B. # of acres in parcel: 38.29 C. Are you the owner of this parcel?  YES  NO (if no - see instructions)

D. Will this be the only well on this parcel?  YES  NO (if no - list other wells)

E. State Parcel ID# (optional):

**Office Use Only**

USGS map name \_\_\_\_\_ DWR map no. 107/K Surface elev. \_\_\_\_\_

Plotted Receipt area only  
Invoice # 528149  
8/9/2004 -- 14:06:20  
Cashier ID: 01  
\$480.00  
Check Purchase- #2634280

WE  
WR  
CWCB  
TOPO  
MYLAR  
BBS

DIV 2 WD 19 BA MD

FORM NO GWS-31 10/94

WELL CONSTRUCTION AND TEST REPORT STATE OF COLORADO, OFFICE OF THE STATE ENGINEER

For Office Use only

RECEIVED

DEC 01 2004

WATER RESOURCES STATE ENGINEER COLO.

1. WELL PERMIT NUMBER 259135

2. OWNER NAME(S) Stephen R & Audrey F Bouvier Mailing Address 69 Azalea Dr City, St, Zip HARMON, CO 82645 Phone (508) 432-6171

3. WELL LOCATION AS DRILLED: NW 1/4 NW 1/4, Sec. 32 Twp. 33 S, Range 66 W DISTANCES FROM SEC. LINES: 950 ft. from north Sec. line. and 1000 ft. from west Sec. line. OR (north or south) (east or west) SUBDIVISION: LOT BLOCK FILING(UNIT) STREET ADDRESS AT WELL LOCATION:

4. GROUND SURFACE ELEVATION ft. DRILLING METHOD Air Rotary DATE COMPLETED November 13, 2004 TOTAL DEPTH 200 ft. DEPTH COMPLETED 200 ft.

5. GEOLOGIC LOG: Table with columns for Depth and Description of Material (Type, Size, Color, Water Location). Entries include 0-10 overburden (Loose), 10-15 Brown shale (tight), 15-37 Gray sandstone (tight), 37-48 Gray shale (tight), 48-101 Gray sandstone / gray shale sands (tight), 101-145 Gray shale (tight), 145-200 Gray shale / gray sandstone sands (tight). H2O water @ 68 x 130 ft.

6. HOLE DIAM. (in.) From (ft) To (ft) 10" 0 10 9" 10 19 6 1/2 19 200

7. PLAIN CASING Table with columns for OD (in), Kind, Wall Size, From(ft), To(ft). Entries include 7 steel 188 7 2 19, 4 1/2 plastic 200 0 60, 4 1/2 plastic 200 80 140, 4 1/2 plastic 200 160 180, 4 1/2 plastic 200 60 80, 4 1/2 plastic 200 140 160, 4 1/2 plastic 200 180 200, 10 intervals 10-20's

8. FILTER PACK: Material NONE Size Interval

9. PACKER PLACEMENT: Type rubber Depth 39'

10. GROUTING RECORD: Table with columns for Material, Amount, Density, Interval, Placement. Entries include cement 3 sacks 18 gals 6 1/2-19 poured, cement 2 sacks 12 gals 10-39 poured

REMARKS:

11. DISINFECTION: Type Liquid Bleach Amt. Used 1 gallon Left in hole

12. WELL TEST DATA: [ ] Check box if Test Data is submitted on Form No. GWS 39 Supplemental Well Test. TESTING METHOD Baker & Air Lift Static Level 60 ft. Date/Time measured 11/13/04 9:00 Production Rate 15 gpm. Pumping level 200 ft. Date/Time measured 11/13/04 9:30-11:30 Test length (hrs.) 2

13. I have read the statements made herein and know the contents thereof, and that they are true to my knowledge. (Pursuant to Section 24-4-104 (13)(a) C.R.S., the making of false statements herein constitutes perjury in the second degree and is punishable as a class 1 misdemeanor.)

CONTRACTOR Boudry Well Drilling Phone (719) 738-3400 Lic. No. 1321 Mailing Address P.O. Box 2295 Colorado CO 81032

Name/Title (Please type or print) Signature Date Kathleen Boudry / Boudry Well Drilling Kathleen Boudry 11-22-04



00562936

# LOCATION PLAT SHEET

MAY 15 1980

DATE May 4, 1980

OWNER \_\_\_\_\_

COLO. OIL & GAS COM. & COM. REG.

SECTION Lot 2, 32

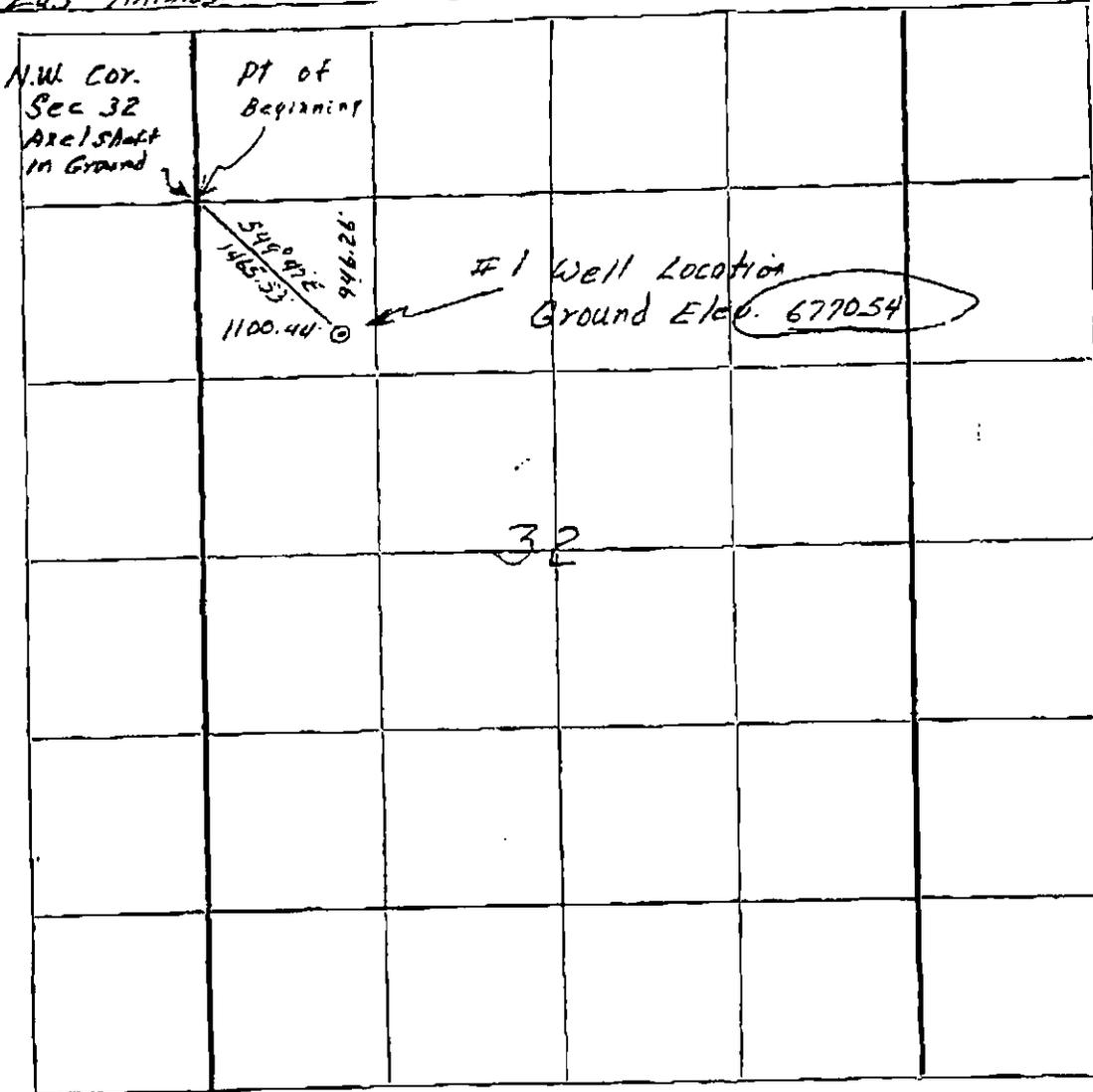
TOWNSHIP 33 South

RANGE 66 West 6th PM

COUNTY Las Animas

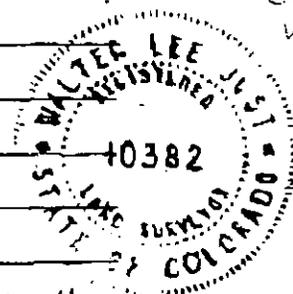
STATE Colorado

SCALE 1" = 1320'



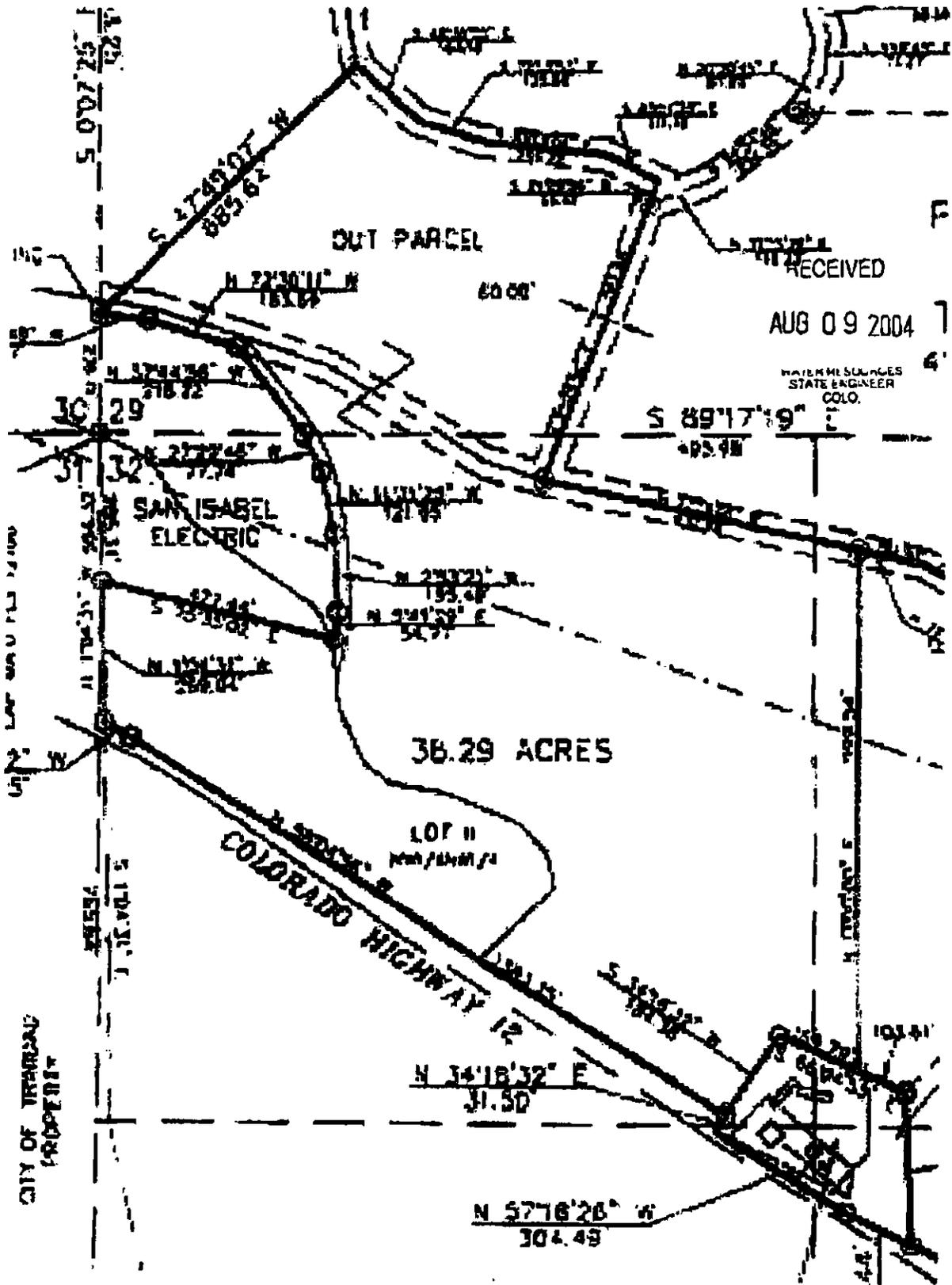
\* Toban  
Land GRID  
~ 60 feet  
South of  
BLM Land  
GRID

	31			36	
1	6			1	6
26	81	*		36	81
	6			1	



COGCC  
well  
spots  
based  
on  
Toban

\_\_\_\_\_  
 I certify that  
 Location for above well  
 has been correctly made  
 as shown. Walter Lee



**APPENDIX F**  
**GROUNDWATER ANALYTICAL REPORTS**





05/21/07

## Technical Report for

---

### LT Environmental

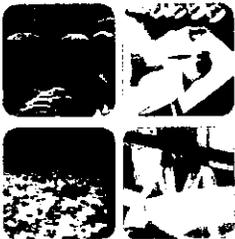
Raton Basin, Trinidad, CO

OGCC 0703

Accutest Job Number: T17322

Sampling Date: 05/01/07

---



### Report to:

LT Environmental

jpeterson@ltenv.com

ATTN: John Peterson

Total number of pages in report: 43



Test results contained within this data package meet the requirements of the National Environmental Laboratory Accreditation Conference and/or state specific certification programs as applicable.

Ron Martino  
Laboratory Manager

This report shall not be reproduced, except in its entirety, without the written approval of Accutest Laboratories.

# Table of Contents

-1-

<b>Section 1: Sample Summary</b> .....	3
<b>Section 2: Sample Results</b> .....	4
2.1: T17322-1: VISS .....	5
2.2: T17322-1A: VISS (DISSOLVED) .....	9
2.3: T17322-2: BOUVIER .....	10
2.4: T17322-2A: BOUVIER (DISSOLVED) .....	14
Chain of Custody .....	16
<b>Section 4: GC Volatiles - QC Data Summaries</b> .....	18
4.1: Method Blank Summary .....	19
4.2: Blank Spike Summary .....	20
4.3: Matrix Spike/Matrix Spike Duplicate Summary .....	21
<b>Section 5: Metals Analysis - QC Data Summaries</b> .....	22
5.1: Prep QC MP6118: As,Ba,B,Cd,Ca,Cr,Cu,Fe,Pb,Mg,Mn,K,Se,Ag,Na .....	23
<b>Section 6: General Chemistry - QC Data Summaries</b> .....	28
6.1: Method Blank and Spike Results Summary .....	29
6.2: Duplicate Results Summary .....	30
6.3: Matrix Spike Results Summary .....	31
<b>Section 7: Misc. Forms (Accutest Laboratories Southeast, Inc.)</b> .....	32
7.1: Chain of Custody .....	33
<b>Section 8: GC Volatiles - QC Data (Accutest Laboratories Southeast, Inc.)</b> .....	35
8.1: Method Blank Summary .....	36
8.2: Blank Spike Summary .....	37
8.3: Matrix Spike Summary .....	38
8.4: Duplicate Summary .....	39
<b>Section 9: General Chemistry - QC Data (Accutest Laboratories Southeast, Inc.)</b> .....	40
9.1: Method Blank and Spike Results Summary .....	41
9.2: Duplicate Results Summary .....	42
9.3: Matrix Spike Results Summary .....	43

### Sample Summary

LT Environmental

Job No: T17322

Raton Basin, Trinidad, CO  
Project No: OGCC 0703

Sample Number	Collected		Received	Matrix		Client Sample ID
	Date	Time By		Code	Type	
T17322-1	05/01/07	08:45 KS	05/02/07	AQ	Water	VISS
T17322-1A	05/01/07	08:45 KS	05/02/07	AQ	Water	VISS (DISSOVLED)
T17322-2	05/01/07	11:10 KS	05/02/07	AQ	Water	BOUVIER
T17322-2A	05/01/07	11:10 KS	05/02/07	AQ	Water	BOUVIER (DISSOLVED)



**Sample Results**

---

**Report of Analysis**

---

## Report of Analysis

<b>Client Sample ID:</b> VISS <b>Lab Sample ID:</b> T17322-1 <b>Matrix:</b> AQ - Water <b>Method:</b> RSKSOP-147/175 <b>Project:</b> Raton Basin, Trinidad, CO	<b>Date Sampled:</b> 05/01/07 <b>Date Received:</b> 05/02/07 <b>Percent Solids:</b> n/a
--	---

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 <sup>a</sup>	XY026227.D	1	05/10/07	AFL	n/a	n/a	F:GXY1038
Run #2							

CAS No.	Compound	Result	RL	MDL	Units	Q
74-82-8	Methane	1.07	0.50	0.30	ug/l	

(a) Analysis performed at Accutest Laboratories, Orlando, FL.

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

Client Sample ID:	VISS	Date Sampled:	05/01/07
Lab Sample ID:	T17322-1	Date Received:	05/02/07
Matrix:	AQ - Water	Percent Solids:	n/a
Method:	SW846 8021B		
Project:	Raton Basin, Trinidad, CO		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	KK019576.D	1	05/11/07	ZLH	n/a	n/a	GKK1070
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

## Purgeable Aromatics

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.21	ug/l	
108-88-3	Toluene	ND	1.0	0.23	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.35	ug/l	
1330-20-7	Xylenes (total)	ND	2.0	0.55	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	4-Bromofluorobenzene	116%		56-136%
98-08-8	aaa-Trifluorotoluene	120%		50-144%

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

## Report of Analysis

Client Sample ID: VISS Lab Sample ID: T17322-1 Matrix: AQ - Water Project: Raton Basin, Trinidad, CO	Date Sampled: 05/01/07 Date Received: 05/02/07 Percent Solids: n/a
---	--

**Metals Analysis**

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Boron	8.9 U	100	8.9	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Calcium	71100	5000	130	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Iron	19 U	100	19	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Magnesium	38900	5000	17	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Potassium	2480 B	5000	130	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Sodium	87600	5000	290	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>

- (1) Instrument QC Batch: MA2928
- (2) Instrument QC Batch: MA2940
- (3) Prep QC Batch: MP6118

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result >= MDL but < RL

## Report of Analysis

Client Sample ID: VISS	Date Sampled: 05/01/07
Lab Sample ID: T17322-1	Date Received: 05/02/07
Matrix: AQ - Water	Percent Solids: n/a
Project: Raton Basin, Trinidad, CO	

### General Chemistry

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Alkalinity, Bicarbonate	227	1.0	0.80	mg/l	1	05/14/07 11:00	TW	SM18 2320B
Alkalinity, Carbonate	0.80 U	1.0	0.80	mg/l	1	05/14/07 11:00	TW	SM18 2320B
Alkalinity, Total as CaCO <sub>3</sub>	227	5.0	0.30	mg/l	1	05/14/07 11:00	TW	EPA 310.1
Bromide <sup>a</sup>	2.0	0.50	0.25	mg/l	1	05/16/07 12:40	AFL	EPA 300/SW846 9056
Chloride	127	5.0	0.57	mg/l	5	05/10/07 12:10	LN	EPA 325.3
Fluoride	0.35	0.10	0.0070	mg/l	1	05/15/07 08:30	TW	EPA 340.2
Nitrogen, Nitrate <sup>b</sup>	0.10	0.10	0.0050	mg/l	1	05/14/07 13:12	LN	SM18 4500NO3E/NO2B
Nitrogen, Nitrate + Nitrite	0.10	0.050	0.0050	mg/l	1	05/14/07 13:12	LN	EPA 353.2
Nitrogen, Nitrite	0.0030 U	0.050	0.0030	mg/l	1	05/02/07 11:53	LN	EPA 353.2
Solids, Total Dissolved	604	10	5.9	mg/l	1	05/08/07	RM	EPA 160.1
Specific Conductivity	1150	1.0		umhos/cm	1	05/14/07 12:00	TW	EPA 120.1
Sulfate	111	3.0	0.66	mg/l	1	05/10/07 13:00	TW	EPA 375.2
pH	7.0			su	1	05/02/07	RM	EPA 150.1/9040

- (a) Analysis performed at Accutest Laboratories, Orlando, FL.  
 (b) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result > = MDL but < RL

## Report of Analysis

<b>Client Sample ID:</b> VISS (DISSOLVED) <b>Lab Sample ID:</b> T17322-1A <b>Matrix:</b> AQ - Water <b>Project:</b> Raton Basin, Trinidad, CO	<b>Date Sampled:</b> 05/01/07 <b>Date Received:</b> 05/02/07 <b>Percent Solids:</b> n/a
--	---

**Metals Analysis**

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Arsenic	2.7 U	5.0	2.7	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Barium	72.6 B	200	3.0	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Cadmium	0.24 U	4.0	0.24	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Chromium	1.8 U	10	1.8	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Copper	6.4 B	25	1.4	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Lead	2.5 B	3.0	0.70	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Manganese	7.7 U	15	7.7	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Selenium	3.5 B	5.0	3.2	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Silver	0.50 U	10	0.50	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>

- (1) Instrument QC Batch: MA2928
- (2) Instrument QC Batch: MA2930
- (3) Prep QC Batch: MP6118

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result >= MDL but < RL

### Report of Analysis

Client Sample ID:	BOUVIER	Date Sampled:	05/01/07
Lab Sample ID:	T17322-2	Date Received:	05/02/07
Matrix:	AQ - Water	Percent Solids:	n/a
Method:	RSKSOP-147/175		
Project:	Raton Basin, Trinidad, CO		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1 <sup>a</sup>	XY026228.D	1	05/10/07	AFL	n/a	n/a	F:GXY1038
Run #2							

CAS No.	Compound	Result	RL	MDL	Units	Q
74-82-8	Methane	ND	0.50	0.30	ug/l	

(a) Analysis performed at Accutest Laboratories, Orlando, FL.

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

### Report of Analysis

Client Sample ID:	BOUVIER	Date Sampled:	05/01/07
Lab Sample ID:	T17322-2	Date Received:	05/02/07
Matrix:	AQ - Water	Percent Solids:	n/a
Method:	SW846 8021B		
Project:	Raton Basin, Trinidad, CO		

Run #	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
Run #1	KK019577.D	1	05/11/07	ZLH	n/a	n/a	GKK1070
Run #2							

Run #	Purge Volume
Run #1	5.0 ml
Run #2	

**Purgeable Aromatics**

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.21	ug/l	
108-88-3	Toluene	0.47	1.0	0.23	ug/l	J
100-41-4	Ethylbenzene	ND	1.0	0.35	ug/l	
1330-20-7	Xylenes (total)	ND	2.0	0.55	ug/l	

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
460-00-4	4-Bromofluorobenzene	109%		56-136%
98-08-8	aaa-Trifluorotoluene	115%		50-144%

ND = Not detected      MDL - Method Detection Limit  
 RL = Reporting Limit  
 E = Indicates value exceeds calibration range

J = Indicates an estimated value  
 B = Indicates analyte found in associated method blank  
 N = Indicates presumptive evidence of a compound

Report of Analysis

Client Sample ID:	BOUVIER	Date Sampled:	05/01/07
Lab Sample ID:	T17322-2	Date Received:	05/02/07
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Raton Basin, Trinidad, CO		

Metals Analysis

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Boron	8.9 B	100	8.9	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Calcium	79800	5000	130	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Iron	45.0 B	100	19	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Magnesium	43900	5000	17	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Potassium	3640 B	5000	130	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Sodium	86800	5000	290	ug/l	1	05/03/07	05/16/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>

- (1) Instrument QC Batch: MA2928
- (2) Instrument QC Batch: MA2940
- (3) Prep QC Batch: MP6118

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result >= MDL but < RL

## Report of Analysis

Client Sample ID:	BOUVIER	Date Sampled:	05/01/07
Lab Sample ID:	T17322-2	Date Received:	05/02/07
Matrix:	AQ - Water	Percent Solids:	n/a
Project:	Raton Basin, Trinidad, CO		

**General Chemistry**

Analyte	Result	RL	MDL	Units	DF	Analyzed	By	Method
Alkalinity, Bicarbonate	274	1.0	0.80	mg/l	1	05/14/07 11:00	TW	SM18 2320B
Alkalinity, Carbonate	8.1	1.0	0.80	mg/l	1	05/14/07 11:00	TW	SM18 2320B
Alkalinity, Total as CaCO3	282	5.0	0.30	mg/l	1	05/14/07 11:00	TW	EPA 310.1
Bromide <sup>a</sup>	1.6	0.50	0.25	mg/l	1	05/16/07 12:56	AFL	EPA 300/SW846 9056
Chloride	92.0	2.0	0.57	mg/l	2	05/10/07 12:10	LN	EPA 325.3
Fluoride	0.39	0.10	0.0070	mg/l	1	05/15/07 08:30	TW	EPA 340.2
Nitrogen, Nitrate <sup>b</sup>	0.20	0.10	0.0050	mg/l	1	05/14/07 13:12	LN	SM18 4500NO3E/NO2B
Nitrogen, Nitrate + Nitrite	0.20	0.050	0.0050	mg/l	1	05/14/07 13:12	LN	EPA 353.2
Nitrogen, Nitrite	0.0030 U	0.050	0.0030	mg/l	1	05/02/07 11:53	LN	EPA 353.2
Solids, Total Dissolved	605	10	5.9	mg/l	1	05/08/07	RM	EPA 160.1
Specific Conductivity	1170	1.0		umhos/cm	1	05/14/07 12:00	TW	EPA 120.1
Sulfate	132	3.0	0.66	mg/l	1	05/10/07 13:00	TW	EPA 375.2
pH	7.2			su	1	05/02/07	RM	EPA 150.1/9040

(a) Analysis performed at Accutest Laboratories, Orlando, FL.  
 (b) Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result >= MDL but < RL

## Report of Analysis

Client Sample ID: BOUVIER (DISSOLVED) Lab Sample ID: T17322-2A Matrix: AQ - Water Project: Raton Basin, Trinidad, CO	Date Sampled: 05/01/07 Date Received: 05/02/07 Percent Solids: n/a
---	--

**Metals Analysis**

Analyte	Result	RL	MDL	Units	DF	Prep	Analyzed By	Method	Prep Method
Arsenic	2.7 U	5.0	2.7	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Barium	45.6 B	200	3.0	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>2</sup>	EPA 200.7 <sup>3</sup>
Cadmium	0.24 U	4.0	0.24	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Chromium	1.8 U	10	1.8	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Copper	5.1 B	25	1.4	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Lead	23.8	3.0	0.70	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Manganese	22.7	15	7.7	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Selenium	3.2 U	5.0	3.2	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>
Silver	0.50 U	10	0.50	ug/l	1	05/03/07	05/09/07 NS	EPA 200.7 <sup>1</sup>	EPA 200.7 <sup>3</sup>

- (1) Instrument QC Batch: MA2928
- (2) Instrument QC Batch: MA2930
- (3) Prep QC Batch: MP6118

RL = Reporting Limit  
 MDL = Method Detection Limit

U = Indicates a result < MDL  
 B = Indicates a result > = MDL but < RL



## Misc. Forms

---

## Custody Documents and Other Forms

---

Includes the following where applicable:

- Chain of Custody



# CHAIN OF CUSTODY

10165 Harwin Drive, Ste. 150, Houston, TX 77036  
 TEL: 713-271-4700 FAX: 713-271-4770  
 www.accutest.com

BTEX 80218

INDEX Time # <b>8160835487084</b>		Bottle Order Control #	
Access Code #		Accutest Job # <b>717322</b>	
<b>Client / Reporting Information</b> Company Name: <b>LT Environmental</b> Address: <b>4600 W. 60th Ave</b> City: <b>Arvada</b> State: <b>CO</b> Zip: <b>80003</b>		<b>Project Information</b> Project Name: <b>Raton Basin</b> Street: City: <b>Trinidad</b> State: <b>CO</b>	
Project Contact: <b>John Peterson</b> E-mail: <b>jpeterson@lten.com</b> Phone #: <b>303-433-9788</b>		Project #: <b>06CC 0708</b> Fax #: <b>303-433-1432</b>	
Sampler's Name: <b>Kyle Siesser</b>		Client Purchase Order #:	
<b>Requested Analysis</b> PH EPA 150.1 Nitrate/Nitrite w/N EPA 350.3 Specific Conductance EPA 120.1 TDS EPA 160.1 Dissolved Methane RSK175 Boron EPA 212.3		<b>Matrix Codes</b> GW - Ground Water WW - Water SW - Surface Water SO - Soil SL - Sludge OI - Oil LO - Other Liquid AIR - Air SOL - Other Solid WP - Waste LAB USE ONLY	
<b>Accutest Sample #</b> 1 Viss 2 Bouvier		<b>Collection</b> Date: 5-1-07 Time: 0845 Sampled By: KGS WW Matrix: WW # of bottles: 10 3 # of bottles: 10 3	
<b>Turnaround Time (Business Days)</b> <input checked="" type="checkbox"/> 10 Day STANDARD <input type="checkbox"/> 5 Day RUSH <input type="checkbox"/> 3 Day EMERGENCY <input type="checkbox"/> 2 Day EMERGENCY <input type="checkbox"/> 1 Day EMERGENCY <input type="checkbox"/> Other		<b>Data Deliverable Information</b> <input type="checkbox"/> Commercial "A" <input type="checkbox"/> Commercial "B" <input type="checkbox"/> Reduced Tier 1 <input type="checkbox"/> Full Tier 1 <input type="checkbox"/> TRRP13 Commercial "A" = Results Only	
Approved By / Date: _____		<input type="checkbox"/> PDF Format	
Comments / Remarks: 3 vials for dissolved methane are unpreserved Note short hold time for Nitrate Metals were not field filtered Please also run BTEX 8021 B.			
Emergency & Rush T/A data available VIA LabLink			
Sample Custody must be documented below each time sample is change possession, including courier delivery.			
Requisitioned by: <b>Kyle Siesser</b> Date/Time: <b>5/1/07</b>	Received by: <b>1</b> Date/Time:	Requisitioned by: <b>2</b> Date/Time:	Received by: <b>2</b> Date/Time:
Requisitioned by: <b>3</b> Date/Time:	Received by: <b>3</b> Date/Time:	Requisitioned by: <b>4</b> Date/Time:	Received by: <b>4</b> Date/Time:
Requisitioned by: <b>5</b> Date/Time: <b>5/1/07 9:30</b>	Received by: <b>A. Radu</b> Date/Time:	Requisitioned by: <b>5</b> Date/Time:	Received by: <b>5</b> Date/Time:
Reserved when applicable		On Use	
		Copy # <b>2-8</b>	

T17322: Chain of Custody

Page 1 of 2





## GC Volatiles

---

## QC Data Summaries

---

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

# Method Blank Summary

Job Number: T17322  
Account: LTENCODE LT Environmental  
Project: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GKK1070-MB	KK019570.D	1	05/11/07	ZLH	n/a	n/a	GKK1070

The QC reported here applies to the following samples:

Method: SW846 8021B

T17322-1, T17322-2

CAS No.	Compound	Result	RL	MDL	Units	Q
71-43-2	Benzene	ND	1.0	0.21	ug/l	
100-41-4	Ethylbenzene	ND	1.0	0.35	ug/l	
108-88-3	Toluene	ND	1.0	0.23	ug/l	
1330-20-7	Xylenes (total)	ND	2.0	0.55	ug/l	

CAS No.	Surrogate Recoveries	Results	Limits
460-00-4	4-Bromofluorobenzene	118%	56-136%
98-08-8	aaa-Trifluorotoluene	132%	50-144%

# Blank Spike Summary

Job Number: T17322  
Account: LTENCODE LT Environmental  
Project: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GKK1070-BS	KK019571.D1		05/11/07	ZLH	n/a	n/a	GKK1070

The QC reported here applies to the following samples:

Method: SW846 8021B

T17322-1, T17322-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
71-43-2	Benzene	20	19.6	98	72-125
100-41-4	Ethylbenzene	20	18.7	94	76-125
108-88-3	Toluene	20	19.7	99	74-125
1330-20-7	Xylenes (total)	60	58.8	98	78-124

CAS No.	Surrogate Recoveries	BSP	Limits
460-00-4	4-Bromofluorobenzene	115%	56-136%
98-08-8	aaa-Trifluorotoluene	126%	50-144%

# Matrix Spike/Matrix Spike Duplicate Summary

Job Number: T17322  
 Account: LTENCODE LT Environmental  
 Project: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
T17371-8MS	KK019573.D	250	05/11/07	ZLH	n/a	n/a	GKK1070
T17371-8MSD	KK019574.D	250	05/11/07	ZLH	n/a	n/a	GKK1070

The QC reported here applies to the following samples:

Method: SW846 8021B

T17322-1, T17322-2

CAS No.	Compound	ug/l	Spike Q	MS ug/l	MS %	MSD ug/l	MSD %	RPD	Limits Rec/RPD
71-43-2	Benzene	4520 <sup>a</sup>	5000	9370	97	9200	94	2	45-137/21
100-41-4	Ethylbenzene	5610 <sup>a</sup>	5000	10400	93	10300	91	1	68-126/15
108-88-3	Toluene	20500 <sup>a</sup>	5000	24300	72	24000	66	1	63-130/22
1330-20-7	Xylenes (total)	14000 <sup>a</sup>	15000	28600	97	28100	94	2	72-125/19

CAS No.	Surrogate Recoveries	MS	MSD	Limits
460-00-4	4-Bromofluorobenzene	118%	118%	56-136%
98-08-8	aaa-Trifluorotoluene	131%	125%	50-144%

(a) Result is from Run #3.



## Metals Analysis

---

## QC Data Summaries

---

Includes the following where applicable:

- Method Blank Summaries
- Matrix Spike and Duplicate Summaries
- Blank Spike and Lab Control Sample Summaries
- Serial Dilution Summaries

BLANK RESULTS SUMMARY  
Part 2 - Method Blanks

Login Number: T17322  
Account: MTENCOR - Environmental  
Project: Raton Basin, Trinidad, CO

QC Batch ID: MP6118  
Matrix Type: AQMS97S

Methods: EPA 200.7  
Units: ug/l

Prep Date: 05/03/07

Metal	RL	IDL	MR raw	final
Aluminum	200	51	ant	
Antimony	5.0	1.3		
Arsenic	5.0	1.4	1.1	<5.0
Barium	200	.1	0.060	<200
Beryllium	5.0	.06		
Boron	100	1.4	-0.37	<100
Cadmium	4.0	.5	0.10	<4.0
Calcium	5000	8	3.6	<5000
Chromium	10	.9	0.22	<10
Cobalt	50	.99		
Copper	25	1.4	-0.23	<25
Iron	100	16	0.23	<100
Lead	3.0	.7	0.79	<3.0
Lithium	300		ant	
Magnesium	5000	8	1.0	<5000
Manganese	15	.2	-0.22	<15
Molybdenum	10	.45		
Nickel	40	.1		
Potassium	5000	80	-35	<5000
Selenium	5.0	1.7	0.85	<5.0
Silver	10	.5	-0.060	<10
Sodium	5000	160	39.5	<5000
Strontium	10	.5		
Thallium	10	1.5		
Tin	20	1.5		
Titanium	10	.5		
Vanadium	50	.4		
Zinc	20	.8	ant	

Associated samples MP6118: T17322-1, T17322-2, T17322-1A, T17322-1A

Results < IDL are shown as zero for calculation purposes  
(\* ) Outside of QC limits  
(ant) Analyte not requested

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: 117422  
 Account: MPNCODE - LT Environmental  
 Project: Baton Basin, Trinidad, CO

Job Batch ID: MP6113  
 Matrix Type: AQUEOUS

Method: EPA 200.7  
 Units: ug/l

Prep Date: 05/15/07 05/15/07

Metal	T17301-1 Original	DUP	RPD	QC Limits	T17301-1 Original MS	Spike/LOL MP/TW3	Rec	QC Limits
Aluminum	acr							
Antimony								
Arsenic	4.2	4.4	4.7	0-20	4.2	419	400	103.7 75-125
Barium	23.9	27.1	12.5	0-20	23.9	452	400	107.0 75-125
Beryllium								
Boron	29.2	30.6	4.7	0-20	29.2	1100	1000	110.0 75-125
Cadmium	0.0	0.0	NC	0-20	0.0	404	100	101.0 75-125
Calcium	8850	9900	11.2	0-20	8850	61700	50000	105.7 75-125
Chromium	1.4	1.5	6.9	0-20	1.4	420	400	104.7 75-125
Cobalt								
Copper	5.6	15.6	94.3 (a)	0-20	5.6	429	400	105.9 75-125
Iron	456	636	33.0* (b)	0-20	456	51900	50000	102.9 75-125
Lead	4.7	4.6	2.2	0-20	4.7	117	400	103.1 75-125
Lithium	acr							
Magnesium	2650	3010	12.7	0-20	2650	58200	50000	111.1 75-125
Manganese	12.7	12.5	1.6	0-20	12.7	434	400	105.3 75-125
Molybdenum								
Nickel								
Potassium	14900	16900	12.6	0-20	14900	70200	50000	110.6 75-125
Selenium	3.6	2.2	48.3 (a)	0-20	3.6	402	400	99.6 75-125
Silver	0.0	0.0	NC	0-20	0.0	420	400	105.0 75-125
Sodium	12500	13100	1.5	0-20	12500	65800	50000	105.0 75-125
Strontium								
Thallium								
Tin								
Titanium								
Vanadium								
Zinc	acr							

Associated samples MP6113: T17322-1, T17322-2, T17322-1A, T17322-2A

Results < IQL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (N) Matrix Spike Rec. outside of QC limits  
 (acr) Analyte not requested  
 (a) RPD acceptable due to low duplicate and sample concentrations.  
 (b) High RPD due to possible sample nonhomogeneity.

MATRIX SPIKE AND DUPLICATE RESULTS SUMMARY

Login Number: T17322  
 Account: LENTON - CC Environmental  
 Project: Raton Basin, Trinidad, CO

QC Batch ID: MP6118  
 Matrix Type: AQUEOUS

Method: EPA 200.7  
 Units: ug/l

Prep Date: 05/15/07

Metal	T17301-1 Original	MSD	Spikelet MP6118	% Rec	MSD RPD	QC Limit
Aluminum	air					
Antimony						
Arsenic	4.2	119	400	103.7	0.0	
Barium	23.9	452	400	107.0	0.0	
Beryllium						
Boron	29.2	1100	1000	110.0	1.0	
Cadmium	0.9	405	400	101.3	0.2	
Calcium	8850	61600	50000	105.5	0.2	
Chromium	1.4	419	400	104.4	0.2	
Cobalt						
Copper	5.6	428	400	105.6	0.2	
Iron	456	51800	50000	102.7	0.2	
Lead	4.7	418	400	103.3	0.2	
Lithium	air					
Magnesium	2650	58100	50000	110.9	0.2	
Manganese	12.7	434	400	105.3	0.0	
Molybdenum						
Nickel						
Potassium	14900	69600	50000	109.4	0.9	
Selenium	3.6	398	400	98.6	1.0	
Silver	0.0	422	400	105.5	0.5	
Sodium	12500	65800	50000	105.0	0.0	
Strontium						
Thallium						
Tin						
Titanium						
Vanadium						
Zinc	air					

Associated samples MP6118: T17322-1, T17322-2, T17322-1A, T17322-2A

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (N) Matrix Spike Rec. outside of QC limits  
 (and) Analyte not requested

SPIKE BLANK AND LAB CONTROL SAMPLE SUMMARY

Login Number: T17322  
 Account: LBNCODE - LT Environmental  
 Project: Raton Basin, Trinidad, CO

QC Batch ID: YP6113  
 Matrix Type: AQUEOUS

Methods: EPA 200.7  
 Units: ug/l

Prep Date: 05/03/07

Metal	BSP Result	Spike/lot MPWJ	Rec	QC Limits
Aluminum	and			
Antimony				
Arsenic	416	400	104.0	80-120
Barium	426	400	106.5	80-120
Beryllium				
Boron	1070	1000	107.0	80-120
Cadmium	408	400	102.0	80-120
Calcium	52200	50000	104.4	80-120
Chromium	420	400	105.0	80-120
Cobalt				
Copper	428	400	107.0	80-120
Iron	51600	50000	103.2	80-120
Lead	418	400	104.5	80-120
Lithium	and			
Magnesium	55500	50000	111.0	80-120
Manganese	423	400	105.8	80-120
Molybdenum				
Nickel				
Potassium	54800	50000	109.6	80-120
Selenium	406	400	101.5	80-120
Silver	418	400	104.5	80-120
Sodium	52900	50000	105.8	80-120
Strontium				
Thallium				
Tin				
Titanium				
Vanadium				
Zinc	and			

Associated samples MP6113: T17322-1, T17322-2, T17322-1A, T17322-2A

Results < 10% are shown as zero for calculation purposes  
 (\*) Outside of QC limits  
 (and) Analyte not requested

Serial Dilution Results Summary

Login Number: T17322  
 Account: INTERCODE - LT Environmental  
 Project: Raton Basin, Trinidad, CO

QC Batch ID: MP6118  
 Matrix Type: AQUEOUS

Methods: EPA 200.7  
 Units: ug/l

Prep Date: 05/15/07

Metal	T17322-1 Original	SDL 1:5	RPD	QC Limits
Aluminum	anr			
Antimony				
Arsenic	4.19	13.4	220.5 (a)	0-10
Barium	23.9	26.7	10.2* (b)	0-10
Beryllium				
Boron	29.2	24.3	14.8 (a)	0-10
Cadmium	0.00	0.00	NC	0-10
Calcium	8850	10200	15.1* (b)	0-10
Chromium	1.44	0.00	100.0 (a)	0-10
Cobalt				
Copper	5.59	0.00	100.0 (a)	0-10
Iron	456	502	9.9	0-10
Lead	1.67	7.54	61.5 (a)	0-10
Lithium	anr			
Magnesium	2650	3000	13.1* (b)	0-10
Manganese	12.7	14.6	15.0* (b)	0-10
Molybdenum				
Nickel				
Potassium	14900	15900	6.3	0-10
Selenium	3.55	0.00	100.0 (a)	0-10
Silver	0.00	0.00	NC	0-10
Sodium	12500	13300	0.2	0-10
Strontium				
Thallium				
Ti:				
Titanium				
Vanadium				
Zinc	anr			

Associated samples MP6118: T17322-1, T17322-2, T17322-1A, T17322-2A

Results < IDL are shown as zero for calculation purposes  
 (\*) Outside of QC Limits  
 (anr) Analyte not requested  
 (a) Percent difference acceptable due to low initial sample concentration (< 50 times IDL)  
 (b) Serial dilution indicates possible matrix interference.



## General Chemistry

---

## QC Data Summaries

---

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY  
 GENERAL CHEMISTRY

Login Number: 117322  
 Account: LTRN006 - LT Environmental  
 Project: Baton Basin, Trinidad, CO

Analyte	Batch ID	RL	MR Result	Units	Spike Amount	BSF Result	SSP %Recov	QC Limits
Alkalinity, Total as CaCO <sub>3</sub>	GN11781	5.0	<5.0	mg/l	2500	2810	113.0	80-120*
Chloride	GN11770	1.0	<1.0	mg/l	1000	1010	101.0	92-107*
Fluoride	GN11751	0.10	<0.10	mg/l	5.0	4.9	98.0	80-120*
Nitrogen, Nitrate + Nitrite	GN11788	0.050	<0.050	mg/l	0.500	0.50	100.0	89-112*
Nitrogen, Nitrite	GN11724	0.050	<0.050	mg/l	0.500	0.51	102.0	89-112*
Solids, Total Dissolved	GN11751	10	<10	mg/l				
Specific Conductivity	GN11765	1.0	<1.0	umhos/cm				
Sulfate	GN11757	3.0	<3.0	mg/l	100	97.0	97.0	80-120*

Associated Samples:

Batch GN11724: T17322-1, T17322-2  
 Batch GN11751: T17322-1, T17322-2  
 Batch GN11754: T17322-1, T17322-2  
 Batch GN11757: T17322-1, T17322-2  
 Batch GN11765: T17322-1, T17322-2  
 Batch GN11770: T17322-1, T17322-2  
 Batch GN11781: T17322-1, T17322-2  
 Batch GN11788: T17322-1, T17322-2  
 (\*) Outside of QC limits

DUPLICATE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: 117322  
Account: TRENCOFF - LE Environmental  
Project: Baton Basin, Trinidad, CO

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Alkalinity, Total as CaCO3	GN11781	T17322-2	mg/l	288	279	1.1	0-10*
Chloride	GN11770	T17370-1	mg/l	<1.0	<1.0	0.0	0-5*
Fluoride	GN11751	T17415-3	mg/l	0.15	0.14	3.0	0-13*
Nitrogen, Nitrate + Nitrite	GN11788	T17364-1	mg/l	0.40	0.40	0.0	0-10*
Nitrogen, Nitrite	GN11724	T17322-1	mg/l	0.0030 U	<0.050	0.0	0-10*
Solids, Total Dissolved	GN11754	T17343-3	mg/l	5.9 U	<10	0.0	0-15*
Specific Conductivity	GN11765	T17217-1	umhos/cm	1020	1000	2.0	0-20*
Sulfate	GN11757	T17322-2	mg/l	132	144	9.0	0-20*
pH	GN11718	T17307-1	su	7.7	7.7	0.0	0-6.8*

Associated Samples:

Batch GN11718: T17322-1, T17322-2  
 Batch GN11724: T17322-1, T17322-2  
 Batch GN11751: T17322-1, T17322-2  
 Batch GN11754: T17322-1, T17322-2  
 Batch GN11757: T17322-1, T17322-2  
 Batch GN11765: T17322-1, T17322-2  
 Batch GN11770: T17322-1, T17322-2  
 Batch GN11781: T17322-1, T17322-2  
 Batch GN11788: T17322-1, T17322-2  
 (\*) Outside of QC limits

MATRIX SPIKE RESULTS SUMMARY  
GENERAL CHEMISTRY

Log# Number: T17327  
Account: WRENCOBE - 01 Environmental  
Project: Ranch Basin, Trinidad, CO

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	Rec	QC Limits
Alkalinity, Total as CaCO <sub>3</sub>	GN11781	T17322-2	mg/l	282	25	303	84.0	78-122
Chloride	GN11770	T17322-1	mg/l	<1.0	10.0	10.2	102.0	81-119
Fluoride	GN11751	T17415-3	mg/l	0.15	1.0	1.1	92.0	69-118
Nitrogen, Nitrate + Nitrite	GN11788	T17364-1	mg/l	0.40	0.100	0.51	110.0	89-119
Nitrogen, Nitrite	GN11724	T17322-1	mg/l	0.0030	0.100	0.11	106.0	75-134
Sulfate	GN11757	T17322-2	mg/l	332	25	355	87.0	75-125

Associated Samples:

Batch GN11724: T17322-1, T17322-2

Batch GN11751: T17322-1, T17322-2

Batch GN11757: T17322-1, T17322-2

Batch GN11770: T17322-1, T17322-2

Batch GN11781: T17322-1, T17322-2

Batch GN11788: T17322-1, T17322-2

(\*) Outside of QC limits

(K) Matrix Spike Rec. outside of QC limits



**Misc. Forms**

---

**Custody Documents and Other Forms**

(Accutest Laboratories Southeast, Inc.)

---

Includes the following where applicable:

- Chain of Custody



ACCUTEST LABORATORIES SAMPLE RECEIPT CONFIRMATION

ACCUTEST'S JOB NUMBER: T17322 CLIENT: AIGC PROJECT: ?
DATE/TIME RECEIVED: 09/08/07 - 0900 # OF COOLERS RECEIVED: 1 COOLER TEMPS: 1.4°
METHOD OF DELIVERY: FEDEX UPS ACCUTEST COURIER GREYHOUND DELIVERY OTHER
AIRBILL NUMBERS: 7986-6896 5460

COOLER INFORMATION

- CUSTODY SEAL NOT PRESENT OR NOT INTACT
CHAIN OF CUSTODY NOT RECEIVED (COC)
ANALYSIS REQUESTED IS UNCLEAR OR MISSING
SAMPLE DATES OR TIMES UNCLEAR OR MISSING
TEMPERATURE CRITERIA NOT MET

TRIP BLANK INFORMATION

- TRIP BLANK PROVIDED
TRIP BLANK NOT PROVIDED
TRIP BLANK NOT ON COC
TRIP BLANK INTACT
TRIP BLANK NOT INTACT
RECEIVED WATER TRIP BLANK
RECEIVED SOIL TRIP BLANK

MISC. INFORMATION

NUMBER OF ENCORES ?
NUMBER OF 5035 FIELD KITS ?
NUMBER OR LAB FILTERED METALS ?

SUMMARY OF COMMENTS:

Samples Unpreserved

TECHNICIAN SIGNATURE/DATE

[Handwritten Signature]

TECHNICIAN SIGNATURE/DATE

ASBD 10/03/06

SAMPLE INFORMATION

- SAMPLE LABELS NOT PRESENT ON ALL BOTTLES
CORRECT NUMBER OF CONTAINERS USED
SAMPLE RECEIVED IMPROPERLY PRESERVED
INSUFFICIENT VOLUME FOR ANALYSIS
TIMES ON COC DOES NOT MATCH LABEL(S)
ID'S ON COC DOES NOT MATCH LABEL(S)
VOC VIALS HAVE HEADSPACE (MACRO BUBBLES)
BOTTLES RECEIVED BUT ANALYSIS NOT REQUESTED
NO BOTTLES RECEIVED FOR ANALYSIS REQUESTED
UNCLEAR FILTERING INSTRUCTIONS
UNCLEAR COMPOSITING INSTRUCTIONS
SAMPLE CONTAINER(S) RECEIVED BROKEN
% SOLIDS JAR NOT RECEIVED
5035 FIELD KIT NOT FROZEN WITHIN 48 HOUR'S
RESIDUAL CHLORINE PRESENT
(APPLICABLE TO EPA 600 SERIES OR NORTH CAROLINA ORGANICS)



## GC Volatiles

---

## QC Data Summaries

(Accutest Laboratories Southeast, Inc.)

---

Includes the following where applicable:

- Method Blank Summaries
- Blank Spike Summaries
- Matrix Spike and Duplicate Summaries

# Method Blank Summary

Job Number: T17322  
Account: ALGC Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODE: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GXY1038-MB	XY026213.D1		05/10/07	JM	n/a	n/a	GXY1038

The QC reported here applies to the following samples:

Method: RSKSOP-147/175

T17322-1, T17322-2

CAS No.	Compound	Result	RL	MDL	Units	Q
74-82-8	Methane	0.51	0.50	0.30	ug/l	

# Blank Spike Summary

Job Number: T17322  
Account: ALGC Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODE: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
GXY1038-BS	XY026216.D1		05/10/07	JM	n/a	n/a	GXY1038

The QC reported here applies to the following samples:

Method: RSKSOP-147/175

T17322-1, T17322-2

CAS No.	Compound	Spike ug/l	BSP ug/l	BSP %	Limits
74-82-8	Methane	108	112	104	54-149

# Matrix Spike Summary

Job Number: T17322  
Account: ALGC Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODE: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
T17322-2MS	XY026230.D	1	05/10/07	JM	n/a	n/a	GXY1038
T17322-2	XY026228.D	1	05/10/07	JM	n/a	n/a	GXY1038

The QC reported here applies to the following samples:

Method: RSKSOP-147/175

T17322-1, T17322-2

CAS No.	Compound	T17322-2 ug/l	Spike Q	MS ug/l	MS %	Limits
74-82-8	Methane	ND	108	108	100	54-149

# Duplicate Summary

Job Number: T17322  
Account: ALGC Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODE: Raton Basin, Trinidad, CO

Sample	File ID	DF	Analyzed	By	Prep Date	Prep Batch	Analytical Batch
T17322-2DUP	XY026229.D1		05/10/07	JM	n/a	n/a	GXY1038
T17322-2	XY026228.D1		05/10/07	JM	n/a	n/a	GXY1038

The QC reported here applies to the following samples:

Method: RSKSOP-147/175

T17322-1, T17322-2

CAS No.	Compound	T17322-2 ug/l	DUP Q	ug/l	Q	RPD	Limits
74-82-8	Methane	ND		ND		nc	24



## General Chemistry

---

### QC Data Summaries

(Accutest Laboratories Southeast, Inc.)

---

Includes the following where applicable:

- Method Blank and Blank Spike Summaries
- Duplicate Summaries
- Matrix Spike Summaries

METHOD BLANK AND SPIKE RESULTS SUMMARY  
 GENERAL CHEMISTRY

Login Number: P17322  
 Account: AACC - Accutest Laboratories Gulf Coast, Inc.  
 Project: MTENCODE: Raton Basin, Trinidad, CO

Analyte	Batch ID	RL	MR Result	Units	Spike Amount	BSP Result	BSP Recov	QC Limits
Bromide	GP9361/GN25532	0.50	<0.50	mg/l	12.5	13.3	106.4	90-110*
Chloride	GP9361/GN25532	2.0	<2.0	mg/l	50	47.6	95.2	90-110*
Nitrogen, Nitrate	GP9361/GN25532	0.10	<0.10	mg/l	2.5	2.51	101.6	90-110*
Nitrogen, Nitrite	GP9361/GN25532	0.10	<0.10	mg/l	2.5	2.75	110.0	90-110*
Sulfate	GP9361/GN25532	2.0	<2.0	mg/l	50	48.9	97.8	90-110*

Associated Samples:  
 Batch GP9361: P17322-1, P17322-2  
 (\*) Outside of QC Limits

DUPLICATE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: T17322  
Account: AACC - Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODE: Baton Rouge, Trinidad, CO

Analyte	Batch ID	QC Sample	Units	Original Result	DUP Result	RPD	QC Limits
Bromide	GP9361/GN25532	T17322-1	mg/l	2.0	2.2	9.5	0-20%
Bromide	GP9361/GN25532	T17322-2	mg/l	1.6	1.9	17.1	0-20%
Chloride	GP9361/GN25532	T17322-1	mg/l	125	127	1.6	0-20%
Chloride	GP9361/GN25532	T17322-2	mg/l	90.6	92.2	1.8	0-20%
Nitrogen, Nitrate	GP9361/GN25532	T17322-1	mg/l	0.24	0.27	11.8	0-20%
Nitrogen, Nitrate	GP9361/GN25532	T17322-2	mg/l	0.30	0.37	20.9 (a)	0-20%
Nitrogen, Nitrite	GP9361/GN25532	T17322-1	mg/l	0.050 U	<0.10	0.0	0-20%
Nitrogen, Nitrite	GP9361/GN25532	T17322-2	mg/l	0.050 U	<0.10	0.0	0-20%
Sulfate	GP9361/GN25532	T17322-1	mg/l	121	121	0.0	0-20%
Sulfate	GP9361/GN25532	T17322-2	mg/l	145	146	0.7	0-20%

Associated Samples:

Batch GP9361: T17322-1, T17322-2

(\*) Outside of QC limits

(a) RPD acceptable due to low duplicate and sample concentrations.

MATRIX SPIKE RESULTS SUMMARY  
GENERAL CHEMISTRY

Login Number: T17322

Account: ALGC - Accutest Laboratories Gulf Coast, Inc.  
Project: LTENCODR: Baton Rouge, Trinidad, CO

Analyte	Batch ID	QC Sample	Units	Original Result	Spike Amount	MS Result	Rec	QC Limits
Bromide	GP9361/GN25532	T17322-1	mg/l	2.0	12.5	14.5	100.8	90-110
Bromide	GP9361/GN25532	T17322-2	mg/l	1.6	12.5	14.5	103.2	90-110
Chloride	GP9361/GN25532	T17322-1	mg/l	125	50	160	70.0N(a)	90-110
Chloride	GP9361/GN25532	T17322-2	mg/l	90.6	50	130	78.8N(a)	90-110
Nitrogen, Nitrate	GP9361/GN25532	T17322-1	mg/l	0.24	2.5	2.9	106.4	90-110
Nitrogen, Nitrate	GP9361/GN25532	T17322-2	mg/l	0.30	2.5	3.0	108.0	90-110
Nitrogen, Nitrite	GP9361/GN25532	T17322-1	mg/l	0.050 N	2.5	3.6	144.0N(a)	90-110
Nitrogen, Nitrite	GP9361/GN25532	T17322-2	mg/l	0.050 N	2.5	3.6	144.0N(a)	90-110
Sulfate	GP9361/GN25532	T17322-1	mg/l	121	50	155	68.0N(a)	90-110
Sulfate	GP9361/GN25532	T17322-2	mg/l	145	50	181	72.0N(a)	90-110

Associated Samples:

Batch GP9361: T17322-1, T17322-2

(\*) Outside of QC limits

(N) Matrix Spike Rec. outside of QC limits

(a) Spike recovery indicates possible matrix interference and/or sample nonhomogeneity.

**APPENDIX G**  
**METHANE DETECTION SYSTEM EQUIPMENT SPECIFICATIONS**



# **GAS DETECTION** **Macurco inc.**

## **Combustible Gas Detector**

Home Furnaces    Telecom Buildings    Landfill Buildings    Commercial Buildings



### **4S1D-1-BR**

**Commercial Grade Combustible Gas detector**

#### **FEATURES:**

- All units individually gas calibrated
- **Detects combustible gases** (Natural Gas, LP, Propane, Butane, and many other hydrocarbons)
- **Standard Calibration** setting is 20% of LEL (Lower Explosive Limit) for natural gas (methane). See list on next page for a partial list of gases that can be detected.
- **Loud Buzzer** (similar to a smoke alarm buzzer) wakes even heavy sleepers.
- **Special Calibrations** are available to meet specific customers needs.
- **Stand Alone Unit.** Powered by 120VAC.
- **Explosion Proof Design.** (Ignition protected)
- **Maintenance free** electronic sensor, supervised
- Mounts on a two gang electrical box and becomes the cover of the box.
- **Gas Detection is Fire Prevention.**

**Manufactured By:**

**MACURCO INC.**  
3946 S. Mariposa Street  
Englewood, Colorado, USA  
303-781-4062 F: 303-761-6640  
[www.macurco.com](http://www.macurco.com)

**Distributed By:**

# Combustible Gases that the 4S1D-1-BR Can Detect

The following is a partial list of the gases that can be detected. The gases marked with an asterisk (\*) can be detected easily with the standard calibration setting of the 4S1D-1-BR. The detector will respond to other gases more slowly or more quickly depending on the hydrocarbon gas present. *Special calibrations are available.*

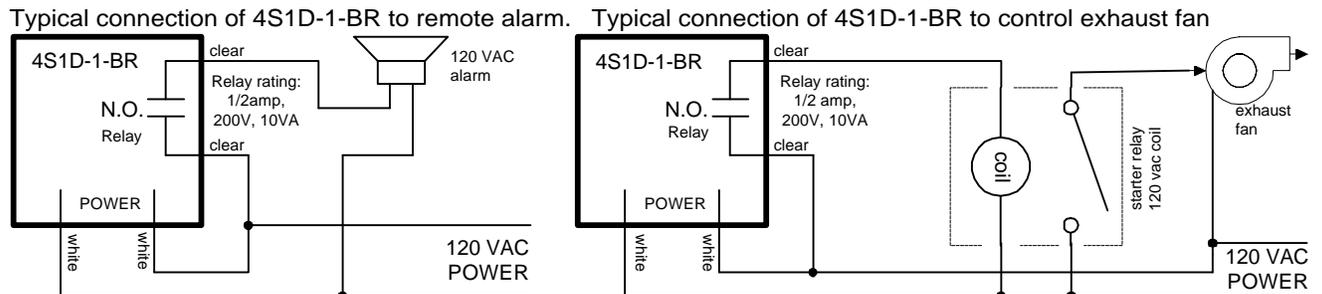
Acetylene *	Alcohol	Benzene
Butane *	Ethane	Ethanol
Ethylene	Gasoline fumes *	Jet fuel
Hydrogen *	Kerosene fumes	Lacquer thinner *
Methane gas *	Methanol	MEK
Natural gas *	Pentane	LP gas *
Propane *	Xylenes	Jet fuel

## Detector Placement

**Where?** The 4S1D-1-BR gas detector should be placed near the source of the gas. Typically, units are placed near furnaces, hot water heaters, other gas appliances, gas fireplaces or along the incoming gas lines. Macurco does not recommend placing gas detectors in kitchens or bathrooms, because nuisance alarms can occur. If a detector is required in the kitchen, place the unit as far away from the stove or fryer as possible.

**Height?** Detectors should be placed close to the ceiling for gases such as natural gas (methane) which are lighter than air. Conversely, with gases like LP/Propane, which are heavier than air, the 4S1D-1-BR should be placed near the floor.

## Two Typical Hookups:



Macurco supplies only the gas detector.

## Specifications:

Power	120VAC, 60 Hz
Current:	Less than 10 Watts
Shipping Weight:	Approximately 2 pounds.
Color:	White
Alarm Sound:	85 db at 10 feet
Alarm Relay rating:	0.5 Amps, 200 V, 10 VA
Sensor Maintenance:	Not required
Sensor Life:	7 to 10 years
Size:	4 ½ X 4 ½ X 1 ½ inches