



May 28, 2009

Certified Mail Return Receipt Requested # 7008 3230 0003 3234 6990

Mr. T.J. Gordon-Ross
15200 Logging Canyon Road
Weston, CO 81091-9557

RE: Complaint 200206469
Water Well Analysis
Well Permit 181073
SWSW 35 32S, 68W Las Animas County, Colorado

Dear Mr. Gordon-Ross:

In response to your concerns regarding possible impacts to water quality from coal bed methane (CBM) operations in the area near your home, the Colorado Oil and Gas Conservation Commission (COGCC) utilized the services of Whetstone Associates to conduct a field visit to your property on March 19, 2009. Water samples were collected for general organic and inorganic water quality testing as well as for analysis of dissolved methane. A summary of the results of the chemical analyses is presented below. The analytical results are also compared to published water quality standards and to results of prior testing of water from your well.

FIELD TESTING

Christa Whitmore of Whetstone Associates visited your property on March 19, 2009. The pump was started at 08:00 and allowed to run for approximately 8 minutes until dry. The pump was started again at 09:45 at a slow rate and allowed to run for 20 minutes. The pH, temperature and conductivity of water coming from the well were stable for 10 minutes before samples were collected. The samples were collected at 10:05. The samples for general chemical analyses were shipped to ALS Paragon in Fort Collins, CO and received by them on March 20, 2009.

COMPARISON OF INORGANIC ANALYTICAL RESULTS TO CDPHE INORGANIC STANDARDS

The Water Quality Control Commission (WQCC) of the Colorado Department of Public Health and Environment (CDPHE) has established "Domestic Use-Quality" human health standards and drinking water standards. Analytical data for the samples from your water well was compared to these standards. This information is summarized in Table 1 which is located in Attachment 1 and discussed in narrative form below. Please keep in mind that these "Domestic Use-Quality Standards" were established for **municipal public** drinking water supplies and often people use and consume ground water from private wells that exceed these standards. The analytical reports from ALS Paragon are included as Attachment 2.

- **Antimony (Sb):** The CDPHE human health standard for antimony is 0.006mg/l. Antimony is a contaminate metal.

Antimony was not detected in the sample collected from your water well.

- **Arsenic (As):** The CDPHE human health standard for arsenic is 0.01 mg/l. Arsenic is a highly poisonous metal.

Arsenic was not detected in the sample collected from your water well.
- **Barium (Ba):** The CDPHE human health standard for barium is 2.0 mg/l. Barium is a contaminate metal.

Barium was not detected in the sample collected from your water well.
- **Beryllium (Be):** The CDPHE human health standard for beryllium is 0.004mg/l. Beryllium is a contaminate metal.

Beryllium was not detected in the sample collected from your water well.
- **Cadmium (Cd):** The CDPHE human health standard for cadmium is 0.005 mg/l. Cadmium is a contaminate metal.

Cadmium was not detected in the sample collected from your water well.
- **Chromium (Cr):** The CDPHE human health standard for chromium is 0.1 mg/l. Chromium is a contaminate metal.

Chromium was not detected in the sample collected from your water well.
- **Lead (Pb):** The CDPHE human health standard for lead is 0.05 mg/l. Prolonged exposure to this metal can result in serious health effects.

Lead was not detected in the sample collected from your water well.
- **Nickel (Ni):** The CDPHE human health standard for nickel is 0.1mg/l. Nickel is a contaminate metal.

Nickel was not detected in the sample collected from your water well.
- **Selenium (Se):** The CDPHE human health standard for selenium is 0.05 mg/l. Selenium is a contaminate metal.

Selenium was detected in the sample collected from your water well at a concentration of 0.0016mg/l which is below the CDPHE human health standard.
- **Silver (Ag):** The CDPHE human health standard for silver is 0.05 mg/l. Excess amounts of silver may cause a permanent gray discoloration of the skin.

Silver was not detected in the sample collected from your water well.
- **Thallium (Tl):** The CDPHE human health standard for thallium is 0.002 mg/l. Thallium is a contaminate metal.

Thallium was not detected in the sample collected from your water well.
- **Uranium (U):** The CDPHE human health standard for thallium is 0.03 mg/l. Uranium can be present due to erosion of natural deposits of this element.

Uranium was detected in the sample collected from your water well at a concentration of 0.00042mg/l which is below the CDPHE human health standard.

- **Fluoride (F)**: The CDPHE human health standard for fluoride is 4.0 mg/l. Where fluoride concentrations are in the range of 0.7 mg/l to 1.2 mg/l health benefits such as reduced dental decay have been observed. Consumption of fluoride at concentrations of greater than 2.0 mg/l can result in mottling of teeth. Consumption of fluoride at concentrations greater than 4.0 mg/l can increase the risk of skeletal fluorosis or other adverse health effects. Fluoride occurs naturally in the ground water in many areas in Colorado at concentrations that exceed the drinking water standard.

Fluoride was detected in the sample collected from your water well at a concentration of 0.32mg/l which is below the CDPHE human health standard.

- **Nitrate (NO₃)**: The CDPHE human health standard for nitrate is 10.0 mg/l. Nitrate can cause cyanosis in infants; a household water supply should not contain nitrate concentration in excess of 10 mg/l.

Nitrate was not detected in the sample collected from your water well.

- **Nitrite (NO₂)**: The CDPHE human health standard for nitrite is 1.0 mg/l. Nitrite concentrations exceeding 1.0 mg/l should not be used for feeding infants.

Nitrite was not detected in the sample collected from your water well.

- **Copper (Cu)**: The CDPHE secondary drinking water standard for copper is 1 mg/l.

Copper was not detected in the sample collected from your water well.

- **Chloride (Cl)**: The CDPHE secondary drinking water standard for chloride is 250mg/l. Chloride concentrations in excess of 250 mg/l usually produce a noticeable taste in drinking water.

Chloride was detected in the sample collected from your water well at a concentration of 5.8mg/l which is below the CDPHE drinking water standard.

- **Iron (Fe)**: The CDPHE secondary drinking water standard for iron is 0.3mg/l. Small amounts of iron are common in ground water. Iron produces a brownish-red color in laundered clothing, can leave reddish stains on fixtures, and impart a metallic taste to beverages and food made with it. After a period of time iron deposits can build up in pressure tanks, water heaters, and pipelines, reducing the effective flow rate and efficiency of the water supply.

Iron was not detected in the sample collected from your water well.

- **Manganese (Mn)**: The CDPHE secondary drinking water standard for manganese is 0.05mg/l. Manganese produces a brownish color in laundered clothing, may stain fixtures and affect the taste of coffee or tea.

Manganese was not detected in the sample collected from your water well.

- **Sulfate (SO₄)**: The CDPHE sulfate secondary standard for human drinking water is 250mg/l. Although CDPHE does not have an agricultural standard for sulfate, other agencies recommend a concentration below 1,500 mg/l for livestock watering. Waters containing high concentrations of sulfate, typically caused by the leaching of natural deposits of magnesium sulfate (Epsom salts) or sodium sulfate (Glauber's salt), may be undesirable because of their laxative effects.

Sulfate was detected in the sample collected from your water well at a concentration of 82mg/l which is below the CDPHE drinking water standard.

- **pH**: pH is the measure of the hydrogen ion concentration in water. The pH of water in its natural state is generally from 5.5 to 9.0. The CDPHE standard for domestic and agricultural water is a range of 6.5 to 8.5. Seven (7) represents neutrality, while values less than 7 indicate increasing acidity and values greater than 7 indicate increasing alkalinity.

pH was measured in the water sample from your well with a value of 7.52 which is within the CDPHE drinking water and agricultural standards.

- **Total Dissolved Solids (TDS)**: CDPHE's TDS standard for human drinking water is 500 milligrams per liter (mg/l). Although CDPHE does not have an agricultural standard for TDS, other agencies recommend concentrations below 1500 mg/l for irrigation, and below 5,000 mg/l for most livestock watering. TDS occurs naturally in the ground water in many areas of Colorado at concentrations that exceed the drinking water standard.

TDS was measured in the water sample collected from your well at a concentration of 260mg/l which is below the drinking water standard.

- **Zinc (Zn)**: CDPHE's Zn standard for human drinking water is 5 milligrams per liter (mg/l) and the agricultural standard is 2mg/l.

Zinc was not detected in the water sample collected from your well.

The following parameters were also measured as part of the laboratory analysis although there are no CDPHE standards.

- **Sodium (Na)**: People on salt restricted diets should be aware of the sodium concentration in the water they drink. A concentration of less than 20 mg/l is recommended by some for people on salt restricted diets or for people suffering from hypertension or heart disease. Sodium occurs naturally in the ground water in many areas of Colorado at concentrations that exceed this health advisory level.

Sodium was detected in the water sample from your well at a concentration of 28mg/l which is above the recommended level.

- **Boron (B)**:

Boron was not detected in the sample collected from your water well.

- **Calcium (Ca)**:

The calcium concentration in the sample collected from your well was 49mg/l.

- **Magnesium (Mg):**

The magnesium concentration in the sample collected from your well was 13mg/l.

- **Potassium (K):**

The potassium concentration in the sample collected from your well was 1.6mg/l.

- **Molybdenum (Mo):**

Molybdenum was not detected in the sample collected from your water well.

- **Bicarbonate (HCO₃):**

Bicarbonate alkalinity was measured in the sample collected from your well at a concentration of 150mg/l.

- **Bromide (Br):**

Bromide was not detected in the sample collected from your water well.

METHANE GAS ANALYSIS

Methane was detected in the sample collected from your well at a concentration of 0.023mg/l. The concentration of methane in the water produced from the well is below the threshold level of 1.1mg/l that could allow methane to accumulate in confined unventilated spaces and potentially be explosive.

VOLATILE ORGANIC COMPOUND ANALYSIS

A target list of sixty-nine volatile organic compounds (VOC) was utilized during analysis of water from your well. One of the 69 target compounds were detected in water samples from your well at a concentration below the report limit for this analysis (dichlorodifluoromethane). No volatile tentatively identified compounds were detected in the water samples from your well.

Dichlorodifluoromethane is a chlorofluorocarbon that has been used as a refrigerant and as a propellant in aerosol spray cans and is generically known as Freon 12. This chemical has not been manufactured in the United States since 1995. I do not know of any reason why this chemical would be present in water from your domestic well. This chemical is present in older car air conditioning systems or in products used to recharge those systems and in older aerosol spray can products including some wasp sprays. I do not know of any use of this chemical in the oil and gas industry. It is possible the reported estimated concentration of dichlorodifluoromethane in samples from your well is an artifact of the analytical process at the lab. The groundwater standards and drinking water standards for the State of Colorado do not include standards for this compound. Other states have utilized a health standard of 1000µg/l for drinking water and groundwater which is approximately 4000 times greater than the concentration reported in water from your well.

SEMI-VOLATILE ORGANIC COMPOUND ANALYSIS

A target list of seventy-two semi-volatile organic compounds (SVOC) was utilized during analysis of water from your well. None of the 72 target compounds were detected in water samples from your well. One semi-volatile tentatively identified compound was detected in the water samples from your well.

The analyst tentatively identified the TIC as an oxygenated hydrocarbon. The one semi-volatile TIC may be an artifact of the analytical process as the same TIC was present in the method blank prepared and analyzed with the sample from your well.

CONCLUSIONS

The inorganic chemistry of water from your well is not similar to coal bed methane (CBM) produced water and does not appear to have been impacted by CBM operations in the vicinity of your home. CBM produced water is typically much higher in sodium content than your well water is. CBM produced water typically has much greater levels of total dissolved solids than water from your well. Waters produced from CBM wells in the Raton Basin are generally of a sodium-bicarbonate character.

Table 1 shows a comparison of results from the sample collected from your well in 2009 to groundwater standards established by the Water Quality Control Commission. None of the parameters exceed the groundwater standards. You should compare the results from the 2009 sampling events to any previous analyses that were performed. The water quality data for the 2009 sampling and analysis does not show any impacts from nearby CBM drilling and production activities.

If you have any questions or would like to discuss these matters further, please contact me at 719-846-3091 or by email at peter.gintautas@state.co.us.

Sincerely,
Colorado Oil and Gas Conservation Commission

Peter Gintautas
Environmental Protection Specialist

Attachments: Attachment 1 - Table 1 - Analytical Summary
Attachment 2 - Paragon Analytics Reports

cc: David Neslin, COGCC Director w/o attachments
Debbie Baldwin, COGCC Environmental Protection Manager w/o attachments
Margaret Ash, COGCC Environmental Protection Supervisor w/o attachments

**TABLE 1
ANALYTICAL SUMMARY
Complaint 200206469
Gordon-Ross Water Well**

Parameter	Water Sample		CDPHE Standards		
	Sample Date				
	19-Mar-09				
	Result	Unit	Domestic	Agriculture	Units
Antimony	ND	mg/l	0.006	NS	mg/l
Arsenic	ND	mg/l	0.01	0.1	mg/l
Barium	ND	mg/l	2.0	NS	mg/l
Beryllium	ND	mg/l	0.004	0.1	mg/l
Boron	ND	mg/l	NS	0.75	mg/l
Cadmium	ND	mg/l	0.005	0.01	mg/l
Calcium	49	mg/l	NS	NS	
Chromium	ND	mg/l	0.1	0.1	mg/l
Cobalt	ND	mg/l	NS	0.05	mg/l
Copper	ND	mg/l	1	0.2	mg/l
Iron	ND	mg/l	0.3	5	mg/l
Lead	ND	mg/l	0.05	0.1	mg/l
Lithium	ND	mg/l	NS	NS	
Magnesium	13	mg/l	NS	NS	
Manganese	ND	mg/l	0.05	0.2	mg/l
Molybdenum	ND	mg/l	0.035	NS	mg/l
Nickel	ND	mg/l	0.1	0.2	mg/l
Potassium	1.6	mg/l	NS	NS	
Selenium	0.0016	mg/l	0.05	0.02	mg/l
Silver	ND	mg/l	0.05	NS	mg/l
Sodium	28	mg/l	NS	NS	
Strontium	0.69	mg/l	NS	NS	
Thallium	ND	mg/l	0.002	NS	mg/l
Uranium	0.00042	mg/l	0.03	NS	mg/l
Zinc	ND	mg/l	5	2	mg/l
Chloride	5.8	mg/l	250	NS	mg/l
Nitrite	ND	mg/l	1.0	10	mg/l
Nitrate	ND	mg/l	10.0	100	mg/l
Total Nitrite/Nitrate	ND	mg/l	10.0	100	mg/l
Fluoride	0.32	mg/l	4.0	NS	mg/l
Total Dissolved Solids	260	mg/l	400	*1500	mg/l
pH	7.52	No units	6.5 - 8.5	6.5 - 8.5	No units
Sulfate	82	mg/l	250	NS	mg/l
Bromide	ND	mg/l	NS	NS	
Total Alkalinity	150	mg/l	NS	NS	
Bicarbonate	150	mg/l	NS	NS	
Carbonate	ND	mg/l	NS	NS	
Conductivity	416	umhos/cm	NS	NS	
methane	0.023	mg/l	NS	NS	
Total Organic Carbon	1.2	mg/l	NS	NS	

Notes

CDPHE	Colorado Department of Public Health and the Environment.
Domestic	Water Quality Control Commission 5 CCR 1002-41, Regulation No. 41 - The Basic Standards For Groundwater.
Agriculture	* Standards for agriculture compiled from CDPHE and other sources.
mg/l	milligrams per liter (ppm or parts per million).
umhos/cm	micromhos per centimeter
NA	Not analyzed.
ND	Not detected.
NS	No Standard.
**	Health Advisory.
	Human health standard.
	Secondary standard.