Ernst Environmental Services
Box 753 Rosebud AB T0J 2T0
Phone: 1-403-677-2074

September 20, 2006

Provincial Health Officer
Alberta Health and Wellness
10025 Jasper Avenue N.W.
P.O. Box 1360, Station Main
Edmonton, Alberta T5J 2N3
Attention: Dr. Nicholas Bayliss, Chief Medical Officer of Health

Re: Gas Composition and Isotopic Fingerprinting results for water - Rosebud, Alberta.

Dear Dr. Bayliss,

I request your assistance with respect to public health and safety risks that might be caused by the water supply at Rosebud, Alberta. Rural landowners with private water wells might also be at risk.

I have a report[1] that shows EnCana perforated and fractured for coalbed methane into the Upper and Middle Horseshoe Canyon fresh water aquifers without collecting appropriate baseline gas data first (as was required under the regulator's rules in place at the time, Refer to *Additional Information* on Page 4). Since that fracturing, a number of area water well owners reported dramatic changes to their water.

I have a report[2] by the Alberta Research Council that states:

> "Since Alberta reservoirs are considered "tight" there have been very few cases where natural methane leakage has occurred"

Months after EnCana's fracturing, the Rosebud water tower exploded (January, 2005), injuring a worker. A propane torch was blamed.

In Colorado, USA, a home blew up last year, injuring the occupant. Stable carbon isotope analysis determined that leaking petroleum wells caused gas migration into the home. Please refer to the attached information for more details.

In a March 6, 2006 meeting, I showed the Honourable Minister of Environment and his staff the above mentioned EnCana report, notably the diagram showing that our aquifers were perforated and fractured into. I expressed my concerns that public health and safety might in jeopardy from industrial chemicals used and natural gas migration caused by this and other fracturing. I requested that the regulator complete detailed testing and gas sampling for composition and stable carbon

[1] *EnCana Corporation. Redland Area NE 10-27-22-W4M*, dated January 2005 and prepared by Hydrogeological Consultants Ltd. 1-800-661-7972. File No.: 04-510. A picture from this report of EnCana's fracturing into the aquifers is attached.
[2] *Enhanced Coalbed Methane Recovery – a Technological Review*, Pg 4 in C3Views200301_Issue5 attached.

isotopic analysis of EnCana's gas wells, and the gases found in the hamlet and private water wells. Initially, Alberta Environment refused to test for hydrocarbons or gas composition, telling me that there was no reason for concern. I repeated my requests. Finally, Alberta Environment assured me that gas samples were accurately collected from the hamlet water supply on March 8 and 14, 2006 and were sent to Dr. Karlis Muehlenbachs, University of Alberta (contact information attached below) for composition and isotopic fingerprinting analysis.

The regulator's final report[3] provides the dissolved methane results, but not the gas composition and stable carbon isotopic fingerprinting results. This missing data concerns me. It is needed to see what other hydrocarbons were present then, and whether or not the fingerprints match those of EnCana's gas. After this data collection occurred, a large, new vent was installed on top of the hamlet water reservoir. I am concerned that this vent will not mitigate the explosive risks, notably if heavier hydrocarbons are seeping into the water supply from deep, industrial sources.

I am also concerned about the bromodichloromethane, xylene, toluene and phthalates, *etc*. found in the hamlet. The regulator explains in their summary report that these chemicals are likely from construction of the new water reservoir, but they were still detected on June 6, 2006 after flushing and refilling the reservoir. Are drinking water reservoirs constructed with toxic chemicals? These chemicals are also used in the petroleum industry; phthalates might have come from the explosives that were blasted into the aquifers. This is not discussed in the regulator's report. The regulator does not include a summary of the depths at which EnCana perforated and fractured above the base of groundwater protection, nor discuss the risks associated with EnCana's potential explosions and fractures directly into the aquifers. The regulator does not discuss the extremely shallow surface casing (it protects groundwater) provided by EnCana in this area or the events of lost circulation and fresh water production.

I am concerned that public health and safety might be at risk from another explosion or adverse health impacts from ingesting and bathing in chlorinated hydrocarbons or chemicals used in the treatment of gas wells. As far as I know, it is not known what the long term health affects are of breathing unburned, chlorinated natural gas venting from taps.

On September 14, 2006, Alberta Environment, Public Health and Wheatland County representatives went door to door in the hamlet of Rosebud to issue a water usage advisory because of detecting bromodichloromethane in the water supply. On June 6, 2006, a slightly higher concentration of bromodichloromethane was detected in the hamlet water; xylene, toluene and phthalates were also still detected even after the cleaning and flushing but no water usage advisory was issued then.

I request please that your department carefully investigate the link between chlorinating water contaminated with hydrocarbons and the detection in the hamlet water supply of the carcinogen bromodichloromethane. It is reported to be a byproduct of coalbed methane production[4].

[3] Hamlet of Rosebud Waterworks System, March 2006 Summary Report. This report is attached.
[4]See p.49 Oil and Gas Extraction, Sector Notebook Project, EPA/310-R-99-006
http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/oil.html)

I request please that your department obtain and review the March 2006 gas composition and isotopic fingerprinting results for the Rosebud hamlet and area water wells to find out which hydrocarbons are present and if any of them match those from EnCana's gas. Isotopic fingerprinting is the only definitive way to determine whether or not industrial natural gas contamination of the aquifers occurred. I expect this is why the regulator requires that baseline aquifer information and gas well samples for isotopic analysis are to be collected before proponents fracture for coalbed methane into aquifers that supply potable water (refer to Footnote 4, referenced in "Additional Information").

Recently EnCana drilled, perforated, fractured and commingled a number of wells in the section where they fractured into the aquifers in 2004. The company just announced that they will be installing multiple water separating facilities in that very section. It was reported to me that commingling gas wells makes accurate isotopic fingerprinting impossible. In May 2006, we pleaded with the regulator to ask EnCana to postpone new activities until the source of possible natural gas seeping into our water is found, and corrected. Alberta Environment's investigator explained to us that he is not able to communicate with the AEUB, and thus could not request a postponement of new industrial activities in the area of the investigation.

EnCana did not provide the required baseline samples for isotopic analysis as the company drilled the 5-14 gas well that later fractured into our aquifers. I request please that your office ask EnCana for samples (to be sent to Dr. Muehlenbachs) for each of the gases detected as the coalbed methane well was drilled. This data is required to complete the fingerprinting analysis as comprehensively as possible.

Missing, incomplete or altered data during a serious groundwater contamination investigation is unacceptable. Rosebud is a lovely Alberta gem with patrons visiting from all over the world. I think it is vital to protect the health and safety of visitors and locals alike – here and elsewhere in the province.

Please advise me as to whether or not your office will fulfill my requests, and if not, please refer me to the appropriate health services agency that is responsible to protect public health and safety in Alberta.

I am doing my best to cope with a challenging situation. I never thought I would lose my safe water and become dependent on deliveries by truck. I never thought that my neighbours and friends would spend months on end trying to resolve an issue as basic as water safety. As a scientist I am baffled by the lack of proper protocols for natural gas contamination investigations and baseline testing for groundwater. The cumulative impacts of thousands of coalbed methane wells and associated treatments, explosions and fracturing are hard to fathom. I believe we can extract natural gas from coal while minimizing impacts. But this needs planning, work and an unwavering commitment to protect another resource owned by the people of Alberta: groundwater. This responsibility should not be downloaded onto ordinary citizens. Your swift assistance on this matter would be greatly appreciated.

Thank you, I am sincerely appreciative of your time and assistance.

Sincerely,

Jessica Ernst, B.Sc, M.Sc.,
President, Ernst Environmental Services

Cc Mr. David Tuer, Chair, Calgary Health Region
Dr. Lyle Oberg, MLA Strathmore-Brooks
Honourable Iris Evans, Minister of Health
Mr. Skattar Sandhu, Occupational and Environmental Health Services, Alberta District, Health Canada

CONTACT INFORMATION FOR DR. KARLIS MUEHLENBACHS
University of Alberta

Position: Professor

Office: ESB 3-22A

Phone: (780) 492-2827

Email: karlis.Muehlenbachs@ualberta.ca

ATTACHMENTS

A scan of the diagram showing EnCana's fracturing into Rosebud fresh water aquifers, from: *EnCana Corporation. Redland Area NE 10-27-22-W4M*, dated January 2005 and prepared by Hydrogeological Consultants Ltd. 1-800-661-7972. File No.: 04-510.

Enhanced Coalbed Methane Recovery – a Technological Review, Pg 4 in C3Views200301_Issue5.

Colorado Oil and Gas Conservation Commission seeks aid in dealing with wells, State agency to ask Legislature for $800K in emergency funding, December 8, 2005 by Herald Denver Correspondent Joe Hanel.

Hamlet of Rosebud Waterworks System, March 2006 Summary Report Prepared by Alberta Environment

ADDITIONAL INFORMATION

EnCana's report states that the company produced 5.6 litres fresh water per minute (this represents 240 cubic metres per month) from their 5-14 coalbed methane well. The report states that the water production was found originating from a fresh water aquifer. Numerous treatments were attempted to stop the water production. They failed. Partial cement squeezes were completed in July 2004.

Unusually high concentrations of nitrogen gas are not normally found in water wells or gas wells. The nitrogen gas concentration found in EnCana's 5-14 gas well in July 2004 after flowing the well for 76 days was very high at 29.65 %. I think this information is critical but it was not included in EnCana's report even though the information was available at the time.

The nitrogen gas concentration in the Sean Kenny water well under investigation in 2004 was also found to be very high at 20.43%. EnCana's 5-14 gas well that fractured into area aquifers is about 1200 metres away from the Kenny well. Rather than use the gas composition data available from the 5-14 gas well, EnCana's hydrogeologists used data from gas wells up to 27 kilometres away. These distant gas wells had low nitrogen gas concentrations of

- 3.93%;
- 4.07%; and
- 2.85%.

EnCana's report concluded: "The concentration of nitrogen in the gas in the groundwater pumped from the Sean Kenny water wells is elevated above the concentrations of nitrogen in gas from gas wells in the area … Also, because the 5-14 Gas Well was flowed for 76 days before the 125.5 to 126.5 metres KB perforations were closed with a cement squeeze, little or no nitrogen is expected to remain in the coal zone from the stimulation." But, EnCana's 5-14 Gas Well nitrogen concentration of 29.65% was from sampling after the 76 days of flow.

On October 10, 2004, EnCana installed a full cement plug on the 5-14 gas well (plugs are not normally installed on a new gas well unless there is a problem), and abandoned the gas well. On December 8, 2004, the nitrogen gas in the Kenny water had dropped to 8.56 %.

Despite the large volumes of fresh water produced, EnCana did not obtain a water diversion permit as required under the regulator's rules[5] in place at the time:

> "Prior to any non saline groundwater being produced from a target coal zone, a CBM/NGC producer must apply to divert and use or dispose of non saline groundwater under the *Water Act.*"

The application to divert fresh water requires significant collection of baseline data before the water bearing coal seams are impacted. Another requirement is (if wells are to be commingled, this sampling would occur as each gas bearing zone is reached during drilling):

> "A sample of the gas produced from CBM/NGC wells must be collected and analyzed to establish baseline conditions. The gas should be analyzed for its composition (methane, ethane, propane, CO2, etc.) and stable carbon isotopes for each of the gases detected."

[5] Alberta Environment Guidelines for Groundwater Diversion for coalbed methane/natural gas in coal Development, 2004.

EnCana Corporation

Redland Area
NE 10-027-22 W4M
Sean Kenny Site Investigation

Prepared by
Hydrogeological Consultants Ltd.
1-800-661-7972
Our File No.: 04-510

January 2005

PERMIT TO PRACTICE
HYDROGEOLOGICAL CONSULTANTS LTD.
Signature
Date 18 Apr 05
PERMIT NUMBER P 385
The Association of Professional Engineers,
Geologists and Geophysicists of Alberta

Table of Contents

APPENDIX A

APPENDIX B

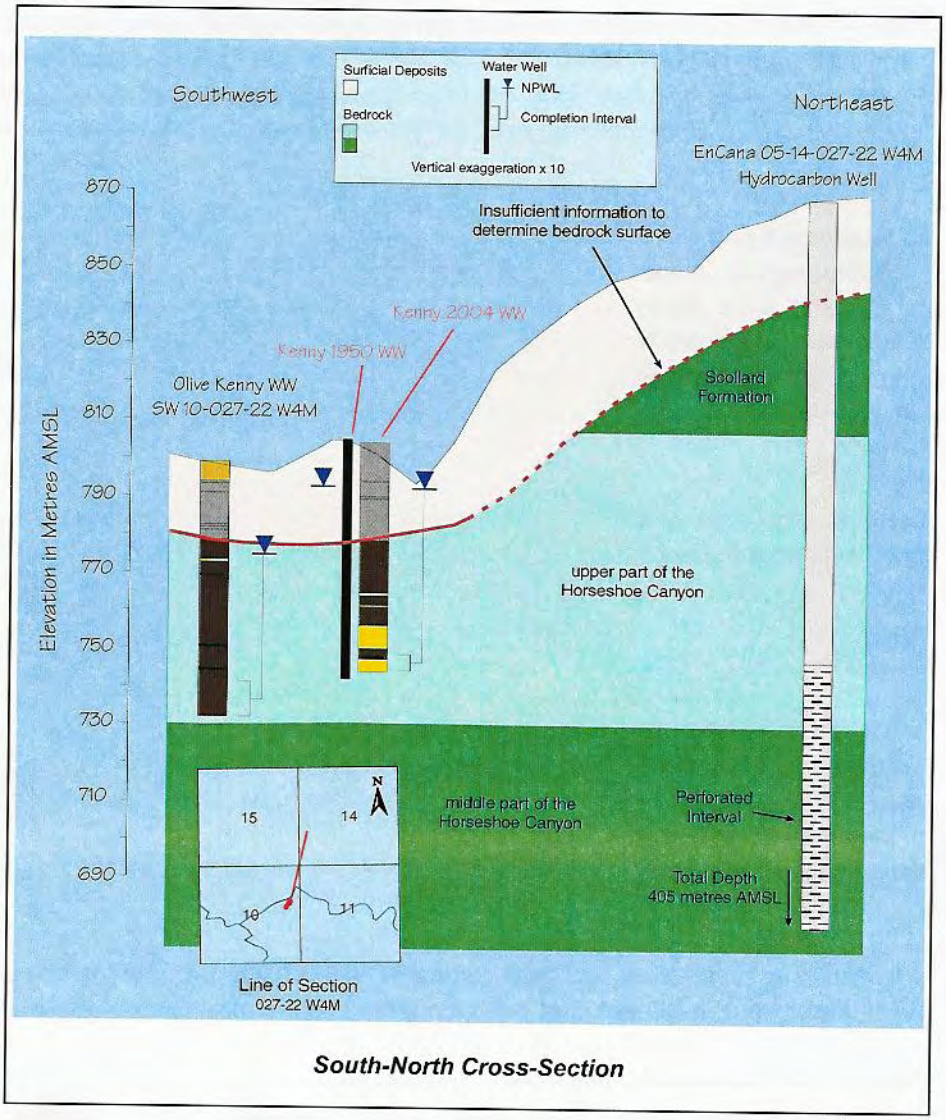
APPENDIX C

APPENDIX D

6. INTERPRETATION

6.1. Aquifers

The SK 1950 WW and the SK 2004 WW are completed in the same hydraulic unit within the upper part of the Horseshoe Canyon Formation. The elevations of the water levels in both water wells are similar; there is no significant difference in the chemical quality of the groundwater from the two water wells and pumping from the SK 1950 WW causes measured drawdown in the water level in the SK 2004 WW. The vertical relationship between the elevation of the completion depths and the non-pumping water levels in the SK 1950 WW and the SK 2004 WW is shown in the adjacent cross-section.



South-North Cross-Section

Also shown on the cross-section is the EnCana 05-14 Gas Well and the perforation interval of the gas well when stimulated on 02 Mar 04. The cross-section shows the top of the perforated interval at an elevation of 747.45 metres AMSL, which coincides closely with the top of the completion interval of the SK 2004 WW.

The stimulation of the EnCana 05-14 Gas Well used nitrogen gas and the estimated pressure outside the perforations is nine megaPascals. Based on an aquifer model, the pressure change measured at the SK 1950 and SK 2004 water wells as a result of the stimulation would be in the order of 0.2 kiloPascals. As a result of flowing the 05-14 Gas Well for 76 days after stimulation, very little if any nitrogen gas would be expected to remain in the coal zone in the 125.5- to 126.5-metres below KB interval.

6.2. Sean Kenny 2004 Water Well

The interpretation of the turbidity data indicates that there are two sources of sediment in the groundwater from the SK 2004 WW. The first source is the groundwater running down the outside of the liner; the second source is the sandstone layers below the coal zone. When the water well is not being pumped, there is a gradual flow of groundwater down the annulus.

Climate Change Central Newsletter

C3 Views

January 2003

Issue 5

Sparking a Less Carbon-Intensive Future – Greenhouse Gas Technologies:

Enhanced Coalbed Methane and Biomass Power

Technology Contributions to Climate Change Challenges – the story continues

Allan Amey

Welcome to the fifth issue of *C3 Views* and the second in a three part series on the contributions technology might make to the climate change challenge. In the last issue, we focused on two important energy technology contributions - wind power and enhanced oil recovery through the use of CO_2 injection. This issue looks at two additional, potentially beneficial, climate change energy technologies– biomass and coal bed methane.

Both of these technologies provide exciting opportunities to not only reduce greenhouse gas emissions but also produce additional energy and reduce overall lifecycle energy costs. A balancing of environmental and economic priorities is required in a truly "sustainable development" future.

These, and indeed all climate change energy technology advancements, are not without challenges. As noted in our last newsletter, to make significant reductions in greenhouse gas emissions globally will require broad commercialization of sustainable energy technologies. Technologies are needed to decrease carbon intensities in potential energy sources, and increase the absorption of carbon dioxide from large emission sources.

The challenge will be to develop technologies that are economically viable and perceived by potential users and consumers as adding increased value. We have attempted to provide a perspective of the successes and challenges relating to both hydrocarbon-based and renewable energy technologies.

Cooperation and innovation amongst diverse stakeholders and experts will drive climate change solutions for the future. Canadians, and Albertans, seem up to the challenge.

Allan Amey is the President and CEO of Climate Change Central.

This is the second in a series of three issues devoted to greenhouse gas technologies.

Enhanced Coalbed Methane Recovery – Technology Overview

Enhanced coalbed methane (ECBM) recovery is aimed at sequestering carbon dioxide (CO_2) while boosting production of methane trapped in coal beds. This is accomplished by injecting carbon dioxide into unmineable coal beds where it is adsorbed, and stored, or sequestered, in the pore matrix of the coal seams. The CO_2 displaces methane gas, which is brought to the surface through wells and pipelined to market much like natural gas. ECBM is similar to the popular practice of injecting CO_2 to enhance production from oil reservoirs.

ECBM is in the early stages of development in Canada. Research is being conducted by the Alberta Research Council (ARC) in conjunction with a consortium of provincial, national and international organizations and companies. While pilot projects are being undertaken by some companies, full commercial development hinges on the success of these efforts.

Alberta and British Columbia coalbed methane deposits

Climate Change Solutions May Be Found in Coalbed Methane Recovery

Enhanced coalbed methane (ECBM) recovery could provide a two-fold environmental benefit, according to Bill Gunter, of the Alberta Research Council (ARC). First, the ECBM process involves sequestering or storing carbon dioxide (CO_2) in the ground instead of releasing it into the atmosphere, thus reducing emissions of greenhouse gases (GHG) that have been linked to global climate change. Second, this process increases methane recovery, providing a clean-burning fossil fuel that produces fewer GHG emissions per unit of energy than oil or coal.

"Geological sequestration of CO_2 is a bridging technology for fossil fuels until we develop greater use of renewables. You can't just stop fossil fuels and start renewables; you have to have these bridging technologies," says Gunter, whose group is leading Canadian research in ECBM.

There is also a strong economic case for ECBM since methane, the chief component of natural gas, is a highly valued energy commodity. However, Gunter points out commercialization of ECBM largely depends on what happens following ratification of the Kyoto Protocol. "To be successful, a dollar value has to be attached to CO_2 emission reductions in the future, something that will likely happen with Kyoto."

There could be up to 135 trillion cubic feet of recoverable methane in the Foothills and Plains regions.

In December, the Canadian government ratified the Kyoto Protocol, an international climate change agreement that requires Canada to reduce its GHG emissions to six per cent below 1990 levels by 2008-2012.

In anticipation of limits on GHG emissions such as CO_2, ARC began working on enhanced coalbed methane in 1996 with the launch of a feasibility study. The second phase moved the project from the drawing board to the field, where a single well test was carried out. In a micro-pilot process similar to huff-and-puff, pure CO_2 was injected and then methane and CO_2 were produced from an existing well in the deeply-buried Mannville coal seams of the Fenn-Big Valley area, southeast of Red Deer, Alberta. The micro-pilot project was then expanded to include three more huff-and-puff-like tests, in which CO_2-N_2 mixtures (simulating industrial waste gas sources) were injected into an existing well and a new well at the same site.

Alberta Energy and Utilities Board estimates about 43 trillion cubic feet remaining of established natural gas reserves.

Now, the project is moving into phase four, where Alberta CO_2 sources are being matched with Alberta coalbed methane reservoirs, leading to more micro-pilot projects in different areas of Alberta. Successful micro-pilot tests will be followed by multi-well tests, with the first project led by Suncor Energy Inc

Although ARC is the only group in Canada working on enhanced coalbed methane recovery, the world's longest field-scale test using CO_2 injection was undertaken by Burlington Resources Inc. in New Mexico.

Environmental Concerns

Mary Griffiths, Environmental Policy Analyst with the Pembina Institute for Appropriate Development, says since enhanced coalbed methane is a new process, care must be taken to establish appropriate legislation to manage development and monitor the environmental impact of these projects.

Continued on page 4

Climate Change Solutions

Continued from page 3

"We're very much in the learning stages and we have to know a lot more about this process. We need to move forward with caution and not rush in until we know all the benefits and risks."

Griffiths says issues need to be resolved surrounding the permanence of CO_2 sequestration to ensure today's ECBM projects don't create problems for future generations. "We need to verify that the CO_2 stays underground. Monitoring must be in place to ensure that once it's injected, the CO_2 doesn't leak back to the surface. The cost of monitoring should be picked up by industry – not the public."

About 175 coalbed methane wells were drilled in Alberta in 2001.

Issues surrounding "dewatering" of ground water as well as the potential for ground water contamination must be addressed to ensure ECBM isn't affecting valuable water resources. Water is produced prior to methane production. The quality of the produced water depends on the depth of the coals. At shallow depths, the water produced is fresher and may be useful for agriculture or human consumption. Deeper coals contain saltier water, which when produced is of no value and must be disposed of in deep injection wells.

Griffiths also suggests an evaluation of the net reductions of CO_2 from ECBM is needed because energy is expended to inject the CO_2 used to help produce methane that will be burned and, in the process, produce more CO_2. While ECBM may turn out to be a good bridging technology between fossil fuels and renewables and there is value in supporting this kind of research, Griffiths thinks that there is also a serious need to increase the amount of funding available to support other options, like renewable energy.

ARC's Gunter agrees that rules will be needed to manage ECBM development. "ECBM needs to be dealt with intelligently so that we can get the best of both worlds from this process," he says.

Gunter says ECBM must be carried out in a way that protects water sources and ensures land erosion doesn't occur due to water disposal methods. He notes the drinkable water from some U.S. coalbed methane operations is being used for irrigation and in one case helped replenish a city's aquifer.

He points out that the geological barriers that have kept methane trapped beneath the earth's surface will keep CO_2 from escaping, particularly since CO_2 more strongly adsorbs into coal than methane. Since Alberta reservoirs are considered "tight" there have been very few cases where natural methane leakage has occurred, which bodes well for CO_2 sequestration.

About 18,000 oil and gas wells were drilled in Western Canada in 2001.

Breakthrough of CO_2 was not a major issue for Burlington Resources at its Allison Unit Project in the San Juan basin. According to Burlington reservoir engineer Jim Schlabaugh, CO_2 breakthrough was controllable and losses through producing wells were contained. However, "long-term migration from the formation through natural avenues has not been studied to this point in time."

Continued on page 5

Climate Change Solutions

Continued from page 4

Injection of CO_2 at the Allison Unit project was started in 1995 and suspended in 2001. The primary objective of the project was to improve coalbed methane recovery, with the coal seam target at an average depth of 1,000 metres. Schlabaugh explains 6.4 billion cubic feet of CO_2 were injected, with an estimated hydrocarbon recovery of 1.6 billion cubic feet. The relationship between these two numbers has "significant uncertainty" because of changes to production operations during the pilot injection period.

In retrospect, Schlabaugh says the Allison Unit project was started too early in the methane depletion process. As a result, high bottom-hole pressures, water production and low permeability in the pilot area hindered injection of CO_2.

"In addition, the CO_2 has a tendency to swell the coal matrix as it is adsorbed, resulting in even further reductions in permeability and injectivity. Injectivity appears to be the key factor in the success of a commercial project."

Injection will not be re-established at the Allison unit project because injection is expensive and there wasn't a significant production decline after injection was suspended.

Methane Potential

The potential for coalbed methane is substantial. In Canada, coal is the largest fossil fuel reserve, containing an estimated 135 to 261 trillion cubic feet of coalbed methane, according to the Canadian Potential Gas Committee. According to ARC, Alberta's largest methane resource lies in coal beds thought to hold as much methane as conventional sources.

Gunter says the challenge for the consortium of provincial, national and international organizations and companies working with ARC on the enhanced coalbed methane recovery project is to develop a viable technology that can be put into commercial operation. Due to the cost and logistics of obtaining a pure CO_2 stream, ARC is also investigating the potential of injecting gases from flue stacks that contain a mixture of CO_2 and other gases.

This work, Gunter says, could lead to the design of zero-GHG emissions power plants that are fuelled either by mined surface coal or by the methane released from coal reservoirs. In this closed process, the CO_2 produced from coal- or methane-burning power plants is injected into deep coal beds to produce more methane. The geological sequestration established in the deep coalbed methane reservoir virtually eliminates the release of CO_2 to the atmosphere.

Primary recovery – where wells are drilled into the coal and methane is produced like natural gas – was first commercialized in the United States because of natural gas shortages and now contributes more than six per cent to their annual gas consumption. Interest in primary methane recovery is also growing in Canada, where the first commercial operation began production last spring.

But Gunter says ARC's work will continue to focus on the dual tasks of sequestering CO_2 while recovering methane.

"Our work is basically driven by the need to reduce CO_2 emissions."

Further Reading:

The Potential for Coalbed Methane (CBM) Development in Alberta
http://www.energy.gov.ab.ca/gmd/docs/Coalbed_Methane_Final_Report_Sept_2002.pdf

Geological Survey of Canada - An Assessment of Coalbed Methane Exploration Projects in Canada
http://rncan.gc.ca/gsc/calgary/whatsnew/newpubs/pdf/B549_e.pdf

Alberta Research Council
http://www.arc.ab.ca/

A trailer home exploded at Bondad Hill in February, and the investigation showed that methane gas leaking from underground reservoirs was to blame.

COGCC seeks aid in dealing with wells
State agency to ask Legislature for $800K in emergency funding
December 8, 2005
By Joe Hanel | Herald Denver Correspondent

DENVER - The agency in charge of cleaning up after a Bondad gas explosion will ask the Legislature for $800,000 in emergency funding to plug an abandoned well and deal with a worsening methane seep.

"Holy mackerel, this is an expensive proposition," said Samuel Potter, who sits on the Colorado Oil and Gas Conservation Commission.

The price tag could climb an additional $750,000 if the commission decides it needs to buy out area property owners to ensure public safety.

A trailer home exploded at Bondad Hill in February, and the investigation showed that methane gas leaking from underground reservoirs was to blame.

Speculation immediately centered on a well drilled and abandoned before 1942 named Nick Spatter Bryce Farms No. 1. The COGCC made several attempts to plug that well over the decades, and finally succeeded in 1994.

The current investigation uncovered another Spatter well - the Bryce 1-X - about 15 feet from the first well. The 1-X was buried when inspectors finally found it this summer, although the COGCC has on file an inspection report of the well from 1998.

"We've had to do some detective work," said David Dillon, the COGCC's deputy director of operations. "We're pretty confident now that this well we have uncovered is the 1-X."

That well is leaking gas from the Fruitland Coal formation - the same place tapped by La Plata County's coal-bed methane wells. The leak started almost 70 years ago, and nearby residents have long complained about methane pollution in their water wells.

The gas commission hired a consultant to measure methane in the soil at 150 different points every few months since the explosion.

"One of the disturbing things is we're starting to see some high concentrations further east where we haven't seen them before," said Debbie Baldwin, a COGCC environmental specialist who has been actively involved in the cleanup.

The latest methane gas survey showed that although the overall size of the gas seep hasn't changed much, methane concentrations have intensified around some nearby homes, the abandoned wells and a modern well owned by Petrogulf Corp.

"That wasn't good news," Baldwin said.

Some detectors - planted 3 feet deep - registered nearly 100 percent methane in the soil.

The high methane concentrations caused a harrowing experience for the last crew that tried to excavate the Bryce 1-X well this year.

"There was so much gas seeping up around the well that the whole pit was on fire. It was very dangerous," Baldwin said. "We had the situation under control. But we needed a different plan."

The gas commission has notified the Colorado Department of Transportation about the leak, which extends under U.S. Highway 550. CDOT doesn't have any immediate plans to deal with the situation, spokeswoman Nancy Shanks said. But a future project will widen the highway from Durango to the New
Mexico border.

Baldwin and the COGCC staff had originally
requested $1.4 million, including $750,000 to buy the affected properties and move neighbors away. But the commissioners decided to wait to see if such a drastic move was necessary.

"I'm not wild about getting into the real-estate business," Potter said.

Two of the affected neighbors have moved, but one person is still living in the area.

"I do think you could live safely on this piece of property," Baldwin said - as long as the methane detectors remain installed and COGCC inspectors have access to the land.

Commissioners - most of whom are experienced in the oil and gas industry - also added $150,000 to the drilling budget because they worried about cost overruns on the complicated project.

The request will go to the Legislature's Joint Budget Committee. With the JBC's approval, the state controller can immediately free up funds for the cleanup.

But the project still faces red tape. Baldwin worries that the COGCC will have to put it out for a competitive bid. That requirement, plus the shortage of drilling rigs caused by the Rocky Mountain gas boom, means it could be months before a rig is available to re-enter the Bryce 1-X.

"Gas is leaking and encroaching on people's homes. Clearly, something needs to be done about it," said Peter Mueller, the commission's chairman. "If somebody got hurt and we're waiting on paperwork, that's a horrible thing to have to wait through."

Petrogulf, which owns the closest operating well to the abandoned Spatter wells, bought the property of Charles Yoakum, who was injured in the explosion. The COGCC is talking about reimbursing Petrogulf for the expense.

"I talked to (Yoakum), and I think he feels he's been treated fairly," Baldwin said. "His health still isn't perfect, but he's much better than he was."

Baldwin has declined to say where Yoakum is living.

This is the COGCC's second emergency funding request. The Legislature approved $200,000 in emergency spending shortly after the February explosion. The final price tag could exceed $1.5 million if the state decides to buy out neighboring landowners.

Alberta
Environment

Web: www.environment.gov.ab.ca

Hamlet of Rosebud's Waterworks System
March 2006 Summary Report

BACKGROUND

Alberta Environment (AENV) is committed to inspecting high quality groundwater drinking water systems like that of the Hamlet of Rosebud's waterworks system.

As a proactive step to verify the Hamlet's system is in compliance and to ensure the Rosebud waterworks system is not being impacted by nearby Coalbed Methane (CBM) activities, the department conducted a compliance inspection of the Rosebud Waterworks System on March 8, 2006. The inspection was unannounced and included the collection of water samples from within the Rosebud distribution system at the local fire hall. The Hamlet's drinking water source is two deep water wells located in Section 14, Range 22, Township 27, West of the 4th Meridian.

Past inspections (i.e. in 2003 and 2005) also included the collection of water samples from the Rosebud distribution system. These samples were submitted for Trihalomethanes (THM) analysis. THM are chlorine disinfection byproducts that form in all water to which chlorine is added for disinfection. The 2003 and 2005 sampling results found the THM levels to be within Health Canada's limits. The 2005 sampling detected trace levels of xylenes and toluene at levels less than 1 ppb (parts per billion), which are such low levels and so close to the detection limit that they were considered to be insignificant and not considered to be a health risk.

SAMPLE SCHEDULE AND ANALYSIS from AENV's March 2006 Inspection:

The March 2006 inspection included collecting samples for routine water parameters, dissolved methane and volatile and extractable organics. The organics samples were sent to the Alberta Research Council (ARC) for analysis and the others to ALS Laboratories. Unfortunately, the ARC samples were lost by the courier, so additional samples were collected by AENV on March 14, 2006. The following are the levels of dissolved methane found at the respective sites for samples taken on March 8 and 14, 2006:

March 8, 2006 Sample Results

- Hamlet's well #1 = 3.01 mg/L;
- Hamlet's well #2 = 3.81 mg/L;
- Fire hall = 2.53 mg/L; and
- Water plant = 2.16 mg/L.

March 14, 2006 Sample Results

- Hamlet's well #1 = 3.55 mg/L;
- Hamlet's well #2 = 4.78 mg/L;

** In addition to dissolved methane, the March 14, 2006 samples were also tested for organics.

**Due to the lack of past methane samples collected from the Hamlet of Rosebud waterworks system, AENV is unable to confirm that the methane concentrations in the system have/have not been impacted. However, current levels suggest that it is unlikely that the Hamlet's water wells have been impacted by CBM activities.*

On March 22, 2006, AENV conducted additional sampling for dissolved methane, chloromethane and total organic carbon (TOC), which is a precursor to THM formation. This was done as a precautionary measure to assure users that the Hamlet's water supply had not been impacted by CBM drilling. The TOC levels in well #1 were 4 mg/L and in well #2, the levels were 3 mg/L. The levels of dissolved methane found in well #1 were 1.55 mg/L and in well # 2 were 3.48 mg/L, which are similar to levels found in the March 14, 2006 samples. Chloromethane levels were found to be <0.01 mg/L below the detection limit.

On March 28, 2006, ARC contacted AENV to discuss the March 14, 2006 sample results, specifically the high levels of toluene found in the water samples, and the presence of some volatile organic compounds not previously detected. These compounds included:

- methyl ethyl ketone (MEK);
- tetrahydrofuran (THF); and
- "iodo" compounds of dichloroiodomethane, bromochloroiodomethane and dibromoiodomethane, which are related to the conventional THM compounds but apparently more carcinogenic. The conventional THMs are chloroform, bromodichloromethane, bromoform and dibromochloromethane.

ARC advised that the source of these unusual compounds was from some new plumbing fixtures, most likely solvent glues or new water piping.

Base on ARC's analysis and concerns, AENV immediately conducted additional water sampling of the Hamlet's waterworks system on March 28, 2006 to determine the source of the compounds. AENV also immediately notified the County of Wheatland of ARC's analysis of the Hamlet's water sample results, and met with the County to share and discuss the results from AENV's March 14, 2006 testing, and to gather background information on the Hamlet's waterworks system. This was done in order to try and pinpoint the source of the contamination and to decide the best course of action to address the issue.

The March 28, 2006 samples were collected for volatile and extractable organics, routine water parameters, heavy metals and nutrients. Open scans were also collected to ensure that no other substances were present. The samples were collected at six specific locations including:

1. well #1;
2. well #2;
3. the upper reservoir (where the well water is blended from the wells but prior to chlorination)
4. prior to entering the water plant;
5. the closest fire hydrant (first point out of the water plant in the distribution system); and
6. the fire hall (middle of the distribution system).

The March 28, 2006 sample results showed the same compounds of concern were still present in the Hamlet of Rosebud's water system but only at the locations downstream of the newly constructed water plant. No volatile or extractable organics were detected in well #1, well #2 or from the upper reservoir, which indicates that the raw water supply was safe and uncontaminated with any of the compounds of concern. The water entering the new water plant showed only trace levels of toluene at 0.5 ug/L, but none of the other compounds of concern.

The water samples collected from the fire hydrant and the fire hall showed the presence of toluene, xylene, MEK, THF, and the iodo compounds that had been found in the March 14, 2006 samples. The results clearly indicated that the source of the contamination was from somewhere within the new water treatment plant.

The March 28, 2006 results were also provided to the Calgary Health Region (CHR) for their review and comment. The CHR advised AENV that the results of the analyses on the collected water samples show that no priority pollutant volatile organic compounds (VOCs) were detected in either well, indicating that the target VOCs were below the level of laboratory detection in the Hamlet's untreated well water at the time of sampling. CHR agrees with AENV's interpretation of these laboratory results, and that the water samples show no indication of adverse health impact by CBM development on the Hamlet's municipal drinking water supply wells. However, CHR cannot ensure that there is no health risks associated with long-term exposure to low levels of the compounds detected in the Hamlet's distribution system, as there are insufficient information available on the compounds detected to make the determination.

On March 31, 2006, AENV sent a letter, including all the sample results, to the County outlining to the County the presence of the organic compounds found in the Hamlet of Rosebud's water supply. AENV also requested that the County submit an action plan to AENV and the CHR. This plan should outline how the County will address the water contamination found in the Hamlet's water supply.

On April 10, 2006, the County of Wheatland submitted its Action Plan, developed by BSEI Engineering Ltd., to AENV. AENV staff reviewed, and with minor modifications accepted the County's proposal to isolate the Hamlet's new treated water reservoir from the drinking water system and to put the temporary water reservoirs back into service. This was done to reduce the potential for any reservoir construction compounds from entering the treated water. This also enabled the County and consultant the opportunity to enter and inspect the newly constructed reservoir.

On April 10, 2006 AENV also provided the County with the department's compliance inspection report stemming from the March 8, 2006 inspection. The inspection found only minor issues of non-compliance unrelated to the water contamination.

The County's Action Plan was initiated on April 11, 2006, and completed by mid May 2006. The Action Plan included the following steps to decontaminate the Hamlet's water treatment plant:

- The County switching from the new water reservoir back to using the old cisterns that had been in use for the past year. This would allow access and cleaning of the new water reservoir.
- Re-Cleaning the new reservoir. involved draining the contaminated water from the new reservoir, scrubbing of the reservoir's walls and ceiling, draining out the dirty water and refilling with superchlorinated water.

- The reservoir was drained again after filling the reservoir with super chlorinated water and left to disinfect for 48 hours.

- Refilling the reservoir with treated water, a process that required a couple of weeks so as to not over use the water wells.

***The cleaning of the new reservoir was initiated immediately due to the continued presence of the organic compounds in the Rosebud water system. During this time, AENV continued to gather water samples from various locations within the Rosebud waterworks system. This was done to monitor the levels of contamination and to ensure the effectiveness of the County's action plan.*

The following is a summary of AENV's samples taken during the County's cleanup of the Hamlet's waterworks system:

- On April 11, 2006, AENV gathered water samples from the old cisterns and from the fire hall. Results of these samples were received during the week of April 18, 2006, and showed no levels of THF or any of the iodo compounds. The results however did show trace levels of MEK, toluene and some new compounds identified only as solvents and diols. ARC was unable to further identify the solvents and diols beyond these broad groupings. Results were again provided to the County and CHR.

- CHR reviewed AENV's March 22, 28, and April 11, 2006 results, which were used to infer and confirm that the presence of the new compounds in the treated water was caused by materials used in the newly constructed treated water reservoir. After an evaluation of the compounds and their concentrations in the drinking water supply, CHR concluded that there were no health concerns. The concentrations detected in the water were below levels at which effects on human health would be expected. As the human health information for some compounds was limited and in the interest of providing the best quality water possible, it was a recommendation by the Calgary Health Region to Alberta Environment and Wheatland County, to explore options for further reducing the concentrations of these compounds that were attributed to the new reservoir construction.

- On April 25, 2006, AENV again gathered water samples from the old cisterns and fire hall (i.e. within the system). Water samples were also collected from the temporary reservoirs and the fire hydrant in the Hamlet. Results show acceptable levels of THM's and only the solvents and diols as unwanted compounds. ARC was again not able to identify the diol compounds any further. This means they could not further speciate the compounds to molecular groups. Results were again provided to the County and the CHR.

On May 1, 2006, after the County refilled the new reservoir but before it was put back into use, AENV again took water samples from the reservoir. No samples were collected from the distribution system since the water here was still being generated from the old cisterns. Results of the samples from within the reservoir showed only trace levels of toluene and xylene at levels that were just above detectable limit and consistent with levels that were found in AENV's 2005 samples.

By the end of May 2006, the County had filled the new reservoirs and utilized the water to actively flush out their distribution system. This was done to ensure that as much of the contaminated water as possible is removed from the distribution system. Once flushing was completed the new reservoir was put back online and began supplying water to Rosebud.

On June 6, 2006, AENV collected another set of samples from the Hamlet of Rosebud's water treatment plant and distribution system. This was done to confirm that the water was safe and free of any unwanted substances. The results show no MEK, THF, iodo compounds, solvents or diols. The only organics detected were the trace levels of toluene and xylene seen earlier, the THMs and some low levels (i.e. sub ppb level) of phthalate compounds, which were not considered significant. ARC was again not able to clearly identify which phthalate compounds were present. The results were passed along to the County and the CHR.

On June 6, 2006 the THM compound bromodichloromethane was found to be slightly above Health Canada's maximum limit of 16 ppb. This was attributed to the elevated levels of chlorine disinfectant present in the water supply and to the low level of water usage. The bromodichloromethane levels should decrease to below Health Canada's limit once the chlorine residuals are reduced, and water usage increases. Additional samples for THM's were collected in July 2006. Results have yet been received by AENV.

In conclusion, both AENV and CHR feels that there is no evidence of adverse health impact from CBM operations on the Hamlet of Rosebud's water wells and that there were no public health concern attributed to the concentrations of those compounds that were detected in the treated water after the new reservoir was put into service. Currently, the Hamlet's waterworks system is in compliance with both AENV and CHR's requirements.

Alberta
HEALTH AND WELLNESS

10025 Jasper Avenue
Box 1360
Edmonton, Alberta
Canada T5J 2N3

September 21, 2006

Ms. Jessica Ernst, B SC, M SC
President
Ernst Environmental Services
Box 753
Rosebud, AB T0J 2T0

Dear Ms. Ernst:

RE: CORRESPONDENCE DATED SEPTEMBER 20, 2006

Thank you for the package regarding water quality in Rosebud, Alberta which I received this afternoon.

I will review the material with the Alberta Health and Wellness staff and prepare a response as soon as possible.

Yours sincerely,

Gloria Keys MD for

Nicholas J. Bayliss, MB BS MPH
Chief Medical Officer of Health

NB/ltr