



Fracking
Gas Drilling's Environmental Threat

Oh, Canada's Become a Home for Record Fracking



Workers on a natural gas drilling rig near Longview, Alberta. (Larry MacDougal/Canadian Press via AP Images)

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Early last year, deep in the forests of northern British Columbia, workers for Apache Corp. performed what the company proclaimed was the biggest hydraulic fracturing operation ever.

The project used 259 million gallons of water and 50,000 tons of sand to frack 16 gas wells side by side. It was "nearly four times larger than any project of its nature in North America," Apache boasted.

The record didn't stand for long. By the end of the year, Apache and its partner, Encana, topped it by half at a neighboring site.

As furious debate over fracking continues in the United States, it is instructive to look at how a similar gas boom is unfolding for our neighbor to the north.

To a large extent, the same themes have emerged as Canada struggles to balance the economic benefits drilling has brought with the reports of water contamination and air pollution that have accompanied them.

The Canadian boom has differed in one regard: The western provinces' exuberant embrace of large-scale fracking offers a vision of what could happen elsewhere if governments clear away at least some of the regulatory hurdles to growth.

Even as some officials have questioned the wisdom of doing so, Alberta and British Columbia have duelled to draw investment by offering financial incentives and loosening rules. The result has been some of the most intensive drilling anywhere.

"There definitely is concern on the part of people living in northeast B.C. on the scale of developments, which are quite significant already and are only in their infancy," said Ben Parfitt, an analyst with the Canadian Centre for Policy Alternatives, a research institute that promotes environmental sustainability. "We are seeing some of the largest fracking operations anywhere on earth."

Canada's eastern regions have proceeded more cautiously. In March, Quebec placed a moratorium on shale development [1] pending further study. Protesters have taken to the streets in New Brunswick [2] demanding the same.

Public opposition, coupled with low gas prices, has slowed drilling over the past year. Still, the Canadian Association of Petroleum Producers expects production from shale and other unconventional sources to more than triple in the next decade.

The industry's aggressive plan for growth has drawn an ambivalent response from the nation's top environmental officials.

In March, Canada's deputy minister of the environment sent an internal memo warning that more work was needed to assess the risks from shale gas drilling [3]. The memo, obtained by an Ottawa-based newspaper and addressed to Environment Minister Peter Kent, said water use and contamination top a list of environmental concerns including air pollution, greenhouse gas emissions and the use of unknown toxic chemicals. Kent subsequently ordered two studies looking at the safety and environmental impacts of shale drilling.

Yet, in a written response to questions from ProPublica, the environment ministry affirmed its commitment to continued development.

"Our Government believes shale gas is an important strategic resource that could provide numerous economic benefits to Canada," the ministry's statement said. Gas is an important part of a clean energy future, the ministry added, saying that "a healthy environment and a strong economy go hand in hand."

B.C., Alberta Lure Drillers

Canada's current drilling boom dates to the late 1990s, when Encana began using fracking to extract gas from dense rock in northern British Columbia.

The second-largest gas driller in North America, Encana also started fracking shallow coal seams, or coalbed methane, in Alberta in the early 2000s, using nitrogen rather than water to free the gas. Coalbed methane drilling generally requires less fluid than fracking shale but occurs much closer to drinking water. In some cases, Encana and other companies have drilled wells directly into aquifers, injecting fracking fluids into groundwater suitable for drinking.

In the middle of the last decade, Encana and other operators started exploring northern British Columbia's shale gas reserves. The formations were promising, holding at least 200 trillion cubic feet of gas, according to industry estimates.

But drillers faced formidable hurdles to get to it. Unlike the Barnett and Marcellus shales in the U.S., Canada's best shale basins are far from most markets and existing infrastructure. Soggy ground slows drilling in the spring and summer, and the average high temperature hovers around zero degrees Fahrenheit in January.

To encourage development, British Columbia enacted a series of incentives, including reduced royalties for deep drilling and credits for building roads and pipelines in the remote regions.

These changes, combined with the area's severe conditions, spurred companies to concentrate and scale up their operations in British Columbia in an effort to cut costs, industry experts say. The result: a string of record-breaking fracks.

In a written response to questions from ProPublica, Apache said this approach reduces surface disturbance. It also can heighten the risk of air and water pollution, said Bruce Kramer, an expert in oil and gas law with McGinnis, Lochridge and Kilgore, a Texas-based law firm.

In both western provinces, the regional authorities responsible for regulating drilling have passed rules to allow more intensive drilling.

In Alberta, drillers can now pack wells closer together and pump more water out of shallow coal seams to free gas more efficiently. British Columbia issued detailed regulations last year that limit where and when companies can drill and set rigorous environmental standards but also gave its Oil and Gas Commission the authority to exempt drillers from virtually all of these provisions.

The commission referred an inquiry from ProPublica to its parent organization, the Ministry of Energy and Mines. In written responses to

questions, the Ministry said the new regulations adequately address environmental concerns over drilling activity in the province. Pointing to an upcoming health study and new rules that compel companies to disclose chemicals used in fracking, officials said they would continue to review and revise standards as necessary.

Still, the regulatory shifts have prompted environmental advocates in Alberta and British Columbia to question whether officials are prepared to cope with rising concerns about water use, contamination and unchecked development.

"We just don't have a clue how big this issue is from a public policy perspective," said Bob Simpson, a member of British Columbia's legislative assembly and an outspoken critic. "We really don't know what we're doing."

Jessica Ernst's Water Problems

Over the last five years, there have been several prominent cases in which Alberta residents have said gas drilling contaminated their water.

There are no hard numbers. The government does not track such complaints. But in some instances, residents' frustration has been exacerbated by their sense that regulators have not properly investigated their claims.

In 2005, Jessica Ernst noticed strange things happening to her water. The toilet fizzed. The faucets whistled. Black particles clogged her filter. Then she began getting rashes.

Ernst, a longtime environmental consultant for oil and gas companies, wondered whether the changes could be connected to drilling nearby. Encana had been drilling shallow coalbed methane wells near her home outside of Rosebud, about 50 miles northeast of Calgary.

She asked Alberta Environment and Water, the agency that oversees groundwater, to test her well. When the well was drilled in 1986, tests showed it had no methane [4]. The new tests, however, showed high levels of the gas, as well as a hydrocarbon called F2 and two other chemicals.

But in 2007, a government research agency concluded it was unlikely that drilling had affected her water [5]. The final report said the chemicals found were not typically used in coalbed methane drilling, and that one had probably come from a plastic tube used to test the water.

Ernst wasn't satisfied with the province's response, however. The government's report concluded that the methane in her well might be occurring naturally because tests showed similar levels of gas in nearby wells. But the tests were conducted after Ernst noticed the changes in her water -- she saw the results as an indication that the contamination might be more widespread.

The government's report also ignored evidence provided by one of its own analysts, a professor of geochemistry at the University of Alberta. When Karlis Muehlenbachs analyzed the gas in Ernst's well for Alberta Environment and Water, he found ethane, a gas often found with methane, with a chemical signature indicating that it had come from deep underground, below the depth of the well. Muehlenbachs told ProPublica that the ethane's signature meant that it could not have been there naturally. He said he is convinced that it resulted from drilling.

As Ernst searched for answers to what happened to her water, she unearthed evidence of other problems related to drilling. She found an Alberta Environment and Water report that listed cases in which the fracking of shallow wells resulted in gas or fluid leaking [6] into nearby gas wells or spraying into the air. She also found government gas well records that said Encana had fracked into the aquifer that supplies her water well.

"The community was used as a test tube," she said. "I was used as a test tube."

Earlier this year, Ernst sued Encana, Alberta Environment and Water and the Alberta Energy Resources Conservation Board [7], which regulates drilling, alleging that Encana's drilling was negligent and that the government agencies had covered up the company's contamination and failed to enforce regulations.

Ernst, who is asking for about \$33 million Canadian in damages and return of wrongful profits, has vowed she will not accept a settlement that includes a confidentiality agreement, as others have done.

"Somebody has to do this," she said.

Alan Boras, a spokesman for Encana, said the company would not comment on the case.

The Energy Resources Conservation Board denied a request for an interview. In written responses to questions, spokesman Bob Curran said he could not comment on the specifics of Ernst's case, but the agency is confident it has conducted itself appropriately.

Carrie Sancartier, a spokeswoman for Alberta Environment and Water, would not comment on Ernst's allegations because of the lawsuit but said there have been no confirmed cases of gas drilling contaminating water wells in the province.

Muehlenbachs, whose work has been used in several government investigations, said that is "simply false." He said he's analyzed thousands of cases of gas leaking up well bores and knows of at least a dozen cases of water contamination.

Alberta has introduced several measures to safeguard water from shallow drilling. In 2006, it established a buffer zone between shallow gas wells and water wells [8] and required drillers to test nearby water wells before drilling into an aquifer [9].

Nevertheless, last January, as part of a review of drilling regulations, the Energy Resources Conservation Board [10] said shallow fracking poses a risk to groundwater.

Is 'Communication' a Risk?

There have been no reports of groundwater contamination related to new drilling in British Columbia.

Increasingly, however, there are reports of something called "communication" -- events in which a fracture travels through the ground and connects two gas wells.

Ken Paulson, chief engineer at the province's Oil and Gas Commission, said these events do not pose a contamination risk. Other experts say their principal impact is to undermine production.

But opponents of expanded shale drilling say instances of communication show that drillers lack a full understanding of what happens when wells are fracked closer together, increasing the risk of contamination. Anthony Ingraffea, an engineering professor at Cornell University, said that if a fracture hit a natural fault, it could allow contaminants to enter aquifers.

Communication has occurred in the U.S. as well: Regulators in Texas, Oklahoma, Michigan and Pennsylvania reported such events to Canadian officials as part of the Energy Resources Conservation Board's regulatory review [10].

Documents provided to ProPublica show that energy companies have reported 25 cases of communication in British Columbia [11] since 2009. Companies are not required to report such events, so the list isn't comprehensive, Paulson said.

In May 2010, the province's Oil and Gas Commission issued a warning when a drilling company inadvertently shot sand from one fracking job into another well [12] being drilled more than 2,000 feet away.

The advisory said the operator contained the resulting jump in pressure within the well but warned of a "potential safety hazard." When communication occurs, Paulson said, the biggest concern is that an operator could lose control of a well and cause a blowout.

Concerns Over Water Consumption

As the debate over communication continues, Parfitt and other Canadian environmentalists have raised more immediate concerns about water use. Fracking requires lots of water -- on their biggest reported fracking job, Apache and Encana used an average of 28 million gallons of water per well.

While the oil and gas industry says it is responsible for 1 percent or less of British Columbia's overall water use, environmental advocates say that may not reflect the full extent of the industry's consumption or long-term needs.

Drillers use both surface and groundwater. Access to surface water is regulated by two agencies that issue long-term licenses or year-long permits. Overwhelmingly, energy companies have chosen to obtain permits, which require less regulatory review.

Most groundwater withdrawals aren't regulated at all. Drillers need permits to sink water wells, but there are no limits on the amount of water that can be taken from them. They can also purchase water from other well owners, so there's no way to track overall use.

"How much water is actually being used and, more importantly, how much water is projected to be used over next the 10 to 15 years? Because of the scattershot approach of regulation, this isn't something we can actually answer right now," said Matt Horne, acting director of the climate change program at the Pembina Institute, an environmental think tank that published a report on the gas industry's water use.

Last year, in a report focusing on province-wide groundwater oversight, British Columbia's auditor general [13] said the province was not adequately protecting aquifers from overuse and potential contamination. Agencies lacked the basic data necessary to assess the risks, such as the number and extent of the province's aquifers, the report said.

The Ministry of Energy and Mines, in a written response to questions, said the province is taking several steps to improve oversight of water use, including a research project studying aquifers. The agency said it can review large groundwater withdrawal projects and that pending changes to the province's water law would regulate withdrawals.

Drillers themselves are also moving to address water concerns. Encana and Apache have started using saline water not suitable for drinking or irrigation in some of their projects. Alan Boras, the Encana spokesman, said the company uses non-potable water almost exclusively in its main operating area in the Horn River Basin, where the largest frack jobs were reported.

Environmentalists say they welcome the effort, but caution that these projects are tiny compared to the industry's overall water use.

Governments, Industry Get Cozy

Public backlash to fracking has become such a concern for drillers and provincial governments in western Canada that last year they launched a joint effort to counter it.

In December 2010, the governments of British Columbia, Alberta and Saskatchewan signed a memorandum of understanding laying out a plan [14] to share information and develop standards for hydraulic fracturing and water use. The provinces invited only one non-governmental entity to participate in the project: the Canadian Association of Petroleum Producers.

The memo, which was leaked in August and published by the Alberta Federation of Labour, a union group, said the provinces and petroleum producers would work together to develop "key messages" on shale drilling to persuade the public not to fear fracking.

"The project will help to demonstrate that shale gas extraction is viable, safe and environmentally sustainable," the memo said.

The memo blamed environmental groups for spreading misleading information and stirring opposition to drilling.

"Environmental Non-Government organizations (ENGOS) are supporting a ill-informed [sic] campaign on hydraulic fracturing and water related issues in British Columbia and in other jurisdictions," it said. "This is expected to grow as shale gas development expands into Alberta and Saskatchewan."

In a separate memo [14], Alberta Environment and Water reported that the Canadian Association of Petroleum Producers had approached the province to work on a joint public relations campaign.

Ultimately, no campaign materialized.

Janet Annesley, a spokeswoman for the Canadian Association of Petroleum Producers, said the group hadn't wanted to join forces on PR but was just informing the province of plans to publish voluntary standards for shale gas drilling.

Still, critics saw the memo as proof of an overly cozy relationship between the government and the industry.

Bart Johnson, a spokesman for Alberta's Energy Minister, said the petroleum producers had suggested a joint PR initiative but dropped the request. Such a collaboration, however, would not have been inappropriate, he said. The government works with industry groups all the time, he said, citing a campaign with education groups against bullying in schools.

"Oil and gas is huge in Alberta. It fuels our economy. Indeed it fuels the economy of Canada," Johnson said. "Any suggestion that we shouldn't meet with that industry is ridiculous."

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1. <http://www.theglobeandmail.com/report-on-business/industry-news/energy-and-resources/quebec-halts-shale-gas-exploration/article1934217/>
 2. <http://www.cbc.ca/news/canada/new-brunswick/story/2011/11/19/nb-hydro-fracking-rally.html>
 3. <http://www.propublica.org/documents/item/279805-environment-canada-shale-gas-memo>
 4. <http://www.propublica.org/documents/item/279806-ernst-water-well-record>
 5. <http://www.propublica.org/documents/item/279821-ernst-well-complaint-review>
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