Dear Mr. Béliveau,

I am writing to you about the situation in Inverness County, "The Ainslie Block": and with regard to the recent press release about the Review of Hydraulic fracturing in Shale Gas Operations.

I have been reading the Environment Act (1995). I am pleased to read that the health of the environment, people and animals and fish are concerns of the Environment Act. In the Energy Acts and regulations, it is as if citizens, the environment and other creatures are of no importance.

In the Environment Act it states that the Minister shall (8)

(a) Promote sustainable development, including pollution prevention;
(b) establish and administer policies, programs, standards, guidelines, objectives, codes of practice, directives and approval processes pertaining to the protection and stewardship of the environment;
(f) Promote the rehabilitation and restoration of degraded areas of the environment;
   Conduct economic analyses to determine the costs and benefits of proposed alterations of the environment and assess methods of offsetting the environmental costs associated with those alterations;

I read somewhere that the Minister may delegate decision-making with regard to an application, to a civil servant working in the Department of the Environment. With regard to the Petroworth Application, I believe that this is a highly political decision which should be decided on by the elected representatives of the people, and should not be a decision made by a public servant. This is because this decision will set a precedent. This decision will affect all future oil, gas, coal and coal gas development in Nova Scotia. As you know, many citizens in many different areas are actively concerned and are forming networks and coalitions and are sending a strong message to the government of Nova Scotia that they do not want "fracking" technology to be used anywhere in the province. The implication of this is "no exploration or extraction of fossil fuels" as 90% of all modern oil and gas extraction involves "fracking". For the citizens of Nova Scotia, "No means No."

The citizens are taking the long term view. They know that fossil fuels are a finite resource and that oil and gas companies are desperately grabbing for the last scraps. Citizens know that there will be minimal benefits to them in the short or the long term term. There may be earth-moving and access-road building jobs and some hotel spaces paid for by the skilled workers who will be flown in on contract from Alberta. We will not be given oil to heat our houses or gas of any type to cook on. All the extracted fossil fuels will be sent to New Brunswick and from there to the USA. A few local people may be trained to service the extraction sites and equipment after the resource is flowing.
If you look at any company's web site that wants to extract fossil fuels, their goal is to make money for their investors and to export the energy to the USA. This is of no benefit to the people of Nova Scotia, and we will be left with another mess and a devastated environment. There may be a small benefit in the royalties paid to the government of Nova Scotia, but like gambling, there will be more people and animal health costs, and severe or complete loss of tourist dollars for the whole of Cape Breton Island –

Please do the math. It would be very useful to do a cost/benefit analysis of this proposed project in "The Ainslie Block". Do you have a good imagination, or are you buying the spin of the Department of Energy and the company and Mr. Darrel Dexter, that we should only be focusing on the initial exploratory well? (This is just a shell game). The citizens are using their imaginations about what the implications and the next steps will be. Over the next few years and in the long term, (after the government has changed and after the company has extracted everything it can from "The Ainslie Block"), the long term degradation of the landscape in Inverness County will be left ..... 

I have a good imagination. I know that with global warming, it is likely that the Anapolis Valley will be under water some time in the future. Where will the city of Halifax get its food? I have a paper written by Elizabeth Beaton at Cape Breton University in which she describes how much food was grown in the old days and sold in other parts of Nova Scotia and was also exported to Newfoundland. It is very important to preserve the earth, water and air so that we will be able to grow our own food. Right now most people buy food at the supermarket that has travelled thousands of miles – soon we will not be able to afford to purchase this food because of the high cost of the energy used in conventional farming, refrigeration, packaging and transportation.

Most citizens asking for a ban on "fracking" are shocked at the proposed design of the "Review of Hydraulic Fracturing in Shale Gas Operations". The Government of Nova Scotia is relying on its own senior staff in the Department of Energy to write up the regulations. These people have previously worked in the oil patch and they truly believe that there is nothing wrong with "fracking."

You and your staff know that there are several serious flaws in the Energy Acts and regulations, as they are now written. I understand that you are doing a 5 year review of your Environmental laws. I urge you to tell the Department of Energy that it is time that they scrap the Energy Acts and regulations as they are out of date and do not consider the environment, people or animals. They should be rewritten.

The people of Nova Scotia are simply saying, “Ban Fracking” –which means that we do not want any exploratory drilling or any extraction of fossil fuels. It is time for us to move ahead and stop looking for fossil fuels. People want to conserve energy and develop clean alternative, renewable energy. The government of Nova Scotia writes fine laws and papers about the importance of going fossil-free – but it is not putting OUR money where its mouth is.

Citizens of Nova Scotia want the government to spend our money (tax dollars), on developing alternative energy projects where there is realistic profit to be made by individuals, community-co-operatives, groups or individuals who will be paid realistic incentive “feed in tariffs” such as those paid out in Ontario and in Europe.

Yours faithfully,

Frances Doomen

CC Darrel Dexter
From: <frac-review@gov.ns.ca>
To:  
Date: 2011-04-21 7:30 AM
Subject: no fracking

ABSOLUETLY NO FRACKING
Get a grip! Do they do this in Alberta? It's time the over-negative-about anything, over the hill, now born again environmental CFA's are taken to task! Our young people can either do fracking here or go to Alberta and do it. I'm sick and tired of all this negative about anything BS, while a few who set off the "landmines" position themselves for Gov't $$$ to be spent to quell the consultative process. Get a life. Our young people need JOBS, private sector JOBS. Not everyone can work for the Gov't.

How does Atlantic Canada compete into the future against a surging Cdn dollar, a resource based economy, falling greenback, and rising energy costs. Surely tourism is going to suffer in the foreseeable future. I don't think you'll see too many 5th wheels or Winnebago's this summer with gas at $6.00 Cdn/gallon and Americans having to pay an exchange on their dollar. Myself being a fisherman/exporter, I don't see us keeping up to a growing Cdn dollar as they increase production of oil in Alberta.

Any new industry is a bonus!

Keith Amero,

Life long resident
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 8:21 AM
Subject: Fracking

Please allow NO fracking in Nova Scotia. Fracking is dangerous to water supplies, to the health of inhabitants, to the environment in various ways.

Nancy Porter-Steele
From: <frac-review@gov.ns.ca>
To: 
Date: 2011-04-21 9:26 AM
Subject: Drill baby drill

We need to get revenues from the natural gas and create infrastructure in NS that drilling will provide. A group of 200 out of a population of 960000 has raised concerns. Let the majority rule for once in this province!
From: Gerald Wheatley
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 10:17 AM
Subject: Fracking

Hydraulic Fracturing is a potentially dangerous process that may involve pollution of water supplies. NS should follow NB and not allow fracking.

A simple way to test this idea is make it mandatory for the fracking company to test all wells in the area of the fracking and a law that makes the company liable for any and all damage done to the water supplies of the area. I can guarantee that the company will not take the risk and decline from fracking in this area.

It is too risky and damaging to the environment. I am appalled that NS is even considering such an idea.

--

Gerald Wheatley
From: <frac-review@gov.ns.ca>
Date: 2011-04-21 11:04 AM
Subject: frac-review

Other items that need to be addressed in the scope of the review:

- Emergency response plans for local volunteer fire departments and training of same
- Effects on local flora and fauna
- Disaster Management Plans - floods, blow outs, explosions, etc
- Effects on local residents - physical, mentally, spiritually
- Testing of water - ground, surface, wells. Scope of testing including things tested for, schedules, cost
- Effects on established livestock, crops
- Storage, transportation, recycling, containment, treatment of NORM (natural occurring radioactive materials)
- Potential noise pollution
- Potential light pollution
- Destruction of non renewable resource to obtain non renewable resource
- Existing infrastructure to benefit from activity
- Effects on roads, bridges due to increased industrial activity

Robert and Rebecca Parkins
From: "Fleet, Chris"
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>, "bilestabrooks@navnet....
CC: 
Date: 2011-04-21 11:31 AM
Subject: Natural Gas Fracking

Good morning,

I am against the provincial government allowing industry to practice natural gas fracking in this province. Clearly the Environment Department MUST put the long term interests of the potentially affected communities first. As demonstrated by many operations in the United States, the practice of hydraulic fracturing to recover natural gas is not only harmful to the environment, but destroys peoples right to live in a decent, quiet community without the constant intrusion of industry trying to rape the area of its natural resources only to leave poisoned water and earth behind. There is not ONE company practicing this type of recovery method can guarantee that the water table and surrounding environment will not be negatively impacted by this. Industry will show many studies that are self-funded by them, that gas fracking is a safe, reliable and cost effective way to remove sub-terrain gas, but environmentalists on the other hand can show just as many studies by reputable research facilities that gas fracking will in fact be just the opposite, a noisy, chemically laden, destructive process that will take decades, or even centuries to correct the negative effects on the residing population of the area, as well as the environment both above and below ground. If examples of this destruction are required, travel to areas affected by this industry and ask the residents about the impact of this on their daily lives. Sure, it can provide jobs and economic stimulus to an otherwise depressed area, but at what cost? All one has to do is look at the tar sand projects in Alberta, the Sydney tar ponds, abandoned mines around the country to see what the legacy of the oil and mining industries are for future generations. Government regulations are developed by industry practices, if an event happens that has a negative impact, the responsible department, in consultation with industry, develops a regulation to prevent further occurrences. However, this only happens if the actual event is discovered. How long will it take the chemicals used in fracking to reach the food chain? A year?, ten years?, fifty? By then the damage is already done and the community is left with little or nothing, no help from industry and certainly no help from government as the companiy in question followed the "regulations" at the time. This is very sad, as it happens all too often (Sydney Steel, Giant Mine, Exxon Valdez, BP oil spill in the Gulf of Mexico, Westray Mine, just to name a few.

Nova Scotia needs to focus on renewable energy, not continually trying to wring out every last available fossil fuel in the province. Encourage businesses and industry to focus on ways to develop environmentally responsible methods of obtaining the energy that the residents of this province need. Remove the monopoly of NSP and Emera on providing the energy requirements to the people of this province, open the market place and encourage competition to fledgling companies that promote sustainable, renewable and clean energy practices. By doing the aforementioned, it will motivate those in the industry already here in the province and may encourage other companies to locate here to bring their products or technologies to the market place and thus reducing the time it takes for the monopoly to provide us with what is already available elsewhere in the world. I am pleased that the province has recently announced that the highway lighting will be switched from high pressure sodium to LED lights, this is certainly a step in the right direction, lets hope that the politicians and bureaucrats that make the top level decisions in this province continue to move in a more environmentally responsible way, and in so doing, will encourage all Nova Scotian's that our moral and financial future rests with clean, renewable energy.

The government and the people of this province have a moral obligation to prevent the destruction of our natural resources, the most important one being water. Nova Scotia is the exhaust pipe of North America, our provincial waters suffer from the onslaught of acid rain caused by Upper Canadian and Mid-USA industries, our lands are eroding due to questionable forestry practices and to introduce an industry that can poison us from far below ground is not only morally wrong, it is irresponsible and should be illegal.

Now is the time for all levels of government to come together and lead the way to sustainable energy practices.

Christopher Fleet
From: Charlie Lush
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 1:25 PM
Subject: Be careful

Having read about the gas fracturing disasters, where loose regulation allowed for an out of control industry to poison water supplies of individuals/communities and destroy property and livelihood due to spills and upsets, I am concerned.

NS would be foolish to allow this industry to proliferate without the safeguards to protect our water and property. Huge quantities of water are pumped underground during the fracturing process, and where does that water come from, as it is not reusable. It is not reusable, because it contains chemical additives, and the "water" cannot be put back into the watershed.

Some of the drilling companies refuse to divulge what the chemical additives are, because that is proprietary information. Well, too bad. Tell me what those chemicals are or you are not drilling! Simple as that.

I think NS has to take a firm position on the above issue. Similarly, if a person's property is damaged because of a spill of drilling fluids, the company should be responsible for making the property good again, not just paying a fine or compensation - actually dig out and remove contaminated soil/water, and replace it with "new" material. I don't think that you can expect individual home owners to battle the companies, it needs government regulation to define what happens when things go wrong.

On the environmental side, I think the government has dropped the ball already on one issue - biomass as fuel for industry, and I am concerned they will also make unwise and irresponsible concessions to the shale gas industry as well.

Sincerely,

Charlie Lush, P. Eng.
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 1:50 PM
Subject: Put an end to Fracking!

No matter how closely this process is monitored, the information will only serve to tell us when it is too late, and our land and water have become poisoned. Mandating that negligent companies provide replacement drinking water for well users does nothing for the natural ecosystems that will be destroyed. Desperately seeking for less and less accessible sources of fossil fuels diverts resources that should be spent on our culture learning how to operate without fossil fuels, and leaves us ever-reliant on a resource that will inevitably become unavailable. Please allow us to use our money, expertise and technology towards transitioning now, while it is by choice instead of by necessity.

Brynn Horley
From: Joanne Macpherson
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 2:42 PM
Subject: Ban Fracking

My family does not want fracking permitted in Nova Scotia because it poses hazardous risks to our water supply and the environment. Today it was announced Fracking Spill In Pennsylvania Prompts Chesapeake Energy To Suspend Gas Drilling Across State.

We don't need any further review. Ban fracking in Nova Scotia.

Joanne MacPherson
From: Alicia Harnett
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 3:24 PM
Subject: Shale fracturing

Quick and to the point; I do not want my province taking part in procedures for the acquisition of resources that harms the environment and pollutes the water. I don’t care whose pocket it hurts. We need to be accountable for our actions and use all this knowledge we are supposed to have to be innovative.

The era of procrastination, of half-measures, of soothing, and baffling expedience of delays is coming to a close. In its place, we are coming to a period of consequences”. Winston Churchill
From: Twilah Purdy
To: <frac-review@gov.ns.ca>
Date: 2011-04-21 10:38 PM
Subject: Fracking

My husband and I work hard to raise food for our family. We like to know what we are eating. We try to eat local food and use no chemicals if we can help it. Why would our government allow companies come in against our will and possibly poison our water and ruin our beautiful land.
From: Carole Langille
To: <frac-review@gov.ns.ca>
CC: Premier Nova Scotia <PREMIER@gov.ns.ca>, <denisepetersmla@bellaliant.com>
Date: 2011-04-21 10:50 PM
Subject: re: FRACKING

To The Honourable Premier Dexter,

The province announced that environmental issues associated with fracking will be reviewed. Are you personally aware of the hazards of fracking? With even cursory research it won’t take you long to see that fracking is worse than uranium mining, which the NDP government was compassionate enough to ban. One chemical in particular used in fracking: 2-BE, a colorless, odorless liquid, dissolves the fat in the cell membrane, causing the membrane to break down, and eventually—“you get sort of bloody eyes, bloody noses, and also blood in the urine,” Theo Colborn, a foremost scientists on the effects of chemicals in the body, testified before the U.S. Congress. And that’s just one chemical: there are hundreds of others—arsenic, hydrogen sulfide, mercury, polycyclic aromatic hydrocarbons, and a category of toxins known as volatile organic compounds, to name a few. Is there a guarantee that these chemicals will not leach the water table? They already have, in many areas, when the fracking fluid is pumped deep underground.

Have you seen the film “Gasland” by Josh Fox, a documentary that was nominated for an Oscar? I think you owe it to Nova Scotians to see this movie. I don’t understand how you can say “we want to make sure that we’re able to protect the environment and we want to make sure that we “are not limiting the industry””. PLEASE LIMIT THE INDUSTRY! Surely the health of our citizens and our planet is paramount. We must find alternative energy sources. And the NDP Government must refuse to allow industry to cause such harm. This issue is crucial. It is of the greatest importance that you speak with scientists who have no connection to the gas companies. There are many who can clarify in convincing detail the dangers of fracking.

Will you get back to me? Thank you.

Sincerely,

Carole Langille
I am yrs old / my wife is 
we live in a modest - mortgage free
5 room house

we have been watching all that is going
on re drilling - fracking etc in and
around

we have every piece of literature
available from newspapers - leaflets
video tape etc.

we have come to the conclusion that
both drilling and fracking is very
dangerous to our health and so many
other things we ask that no permits
be given to any and all companies.
what would be affected should they
get a permit to drill?

1 - water could be polluted - non drinkable
2 - any water from ponds will drain
into heritage river margaree -
bras d'or lakes - no fishing etc
3 - no swimming or boating -
tourism would be in big trouble.
4 - property values would decrease.
5 - there will more layoffs then
you can imagine.
6 - please do not give a license
to drill or frack - to anyone! other
provinces are not allowing it!

see page 2
I HAVE A BOX FULL OF EVERY PIECE WRITTEN IN NEWSPAPERS ETC. THAT I READ. THE PEOPLE SIMPLY DO NOT WANT THIS DRILLING AND FRACKING.

THE ONLY PEOPLE THAT WANT IT IS THE OIL COMPANY OWNER. HE WOULD ONLY EMPLOY A DRILL TEAM AND MAYBE A COUPLE LABOURERS. I DARE SAY HE BRINGS HIS OWN MEN WITH HIM. SO WHERE ARE THESE JOBS IT WOULD CREATE?

ONCE AGAIN -

PLEASE - DO NOT GIVE A PERMIT TO DRILL OR FRACK TO ANYONE.

THANK YOU FOR TAKING THE TIME TO READ MY LETTER

Your Truly

W.B. Woodhouse
From: Bill Hardstaff
To: <frac-review@gov.ns.ca>
Date: 2011-04-24 10:55 AM
Subject: hydraulic fracturing for gas extraction from shale formations . . .

Sir,

I work at the National Research Council in Halifax and have been doing some reading of the literature concerning hydraulic fracturing of shale formations to facilitate extraction of oil and gas. I understand that horizontal fracturing is a means of tapping shale deposits containing natural gas that were previously inaccessible by conventional drilling. Vertical hydro-fracturing is a last resort effort to extend the life of an existing well once its productivity starts to run out. Horizontal fracturing differs in that it uses a mixture of 596 chemicals, many of them proprietary, and millions of gallons of water per fracturing. This water then becomes contaminated and must be cleaned and disposed of. As well, aquifers of potable water are at risk. People who lose their access to safe drinking water require relocation and significant compensation.

The industry in the US refuses to disclose the chemical make-up of the fluids being used, and the Bush/Cheney energy bill of 2005 exempts them from the controls of the safe drinking water act. This and many other facts are discussed in a documentary entitled "Gasland".

Although I trust you and other members of our New Democratic government, I worry that in the future the North American Free Trade Act provisions may allow private American interests (and Canadian ones owned by Americans) to force the issue by suing provincial governments for loss of profit should we attempt to create legislation to protect our citizens.

I urge you not only to examine this particular issue carefully, but also the implications of predatory American business practices which have destroyed the American economy and are subverting the US political system. From what I understand there were no legal consequences for those who participated in the 2008 banking system collapse and, even more troubling, President Obama has been unable to pass legislation to regulate the financial industry there. Conditions exist which allow many American corporations to continue to maximize profits while destroying with impunity the nation in which they operate.

Bill Hardstaff
From: "Graham Hutchinson,
To: <energyminister@gov.ns.ca>
CC: <frac-review@gov.ns.ca>
Date: 2011-04-26 6:11 PM
Subject: Lawsuit

MEDIA ADVISORY - Announcement of Multi-Million Dollar Landmark North American Lawsuit on Hydraulic Fracturing and Its Impact on Groundwater
Suit Accuses EnCana, Alberta Environment and Energy Resources Conservation Board of Negligence and Unlawful Activities

Case To Be Presented at United Nations in New York


Regards

Graham
Graham Hutchinson
MEDIA ADVISORY - Announcement of Multi-Million Dollar Landmark North American Lawsuit on Hydraulic Fracturing and Its Impact on Groundwater

Suit Accuses EnCana, Alberta Environment and Energy Resources Conservation Board of Negligence and Unlawful Activities

Case To Be Presented at United Nations in New York

CALGARY, April 26 /CNW/ -

PRESS CONFERENCE:

WHEN: Wednesday April 27th
11:00 AM

WHERE: Lounge, Kensington Riverside Inn,
1128 Memorial Dr. NW
Calgary, AB

1.) Nearly a decade ago, EnCana, one of the world’s largest natural gas producers, began a risky and experimental drilling program that required intense hydraulic fracturing for shallow coalbed methane (Horseshoe Canyon Formation) throughout central Alberta.

2.) Hydraulic fracturing blasts open oil, gas and coal formations with highly pressurized volumes of water, sand and undisclosed chemical fluids or gases. The technology has boosted natural gas reserves but has become the subject of serious government investigations throughout North America due to surface and groundwater contamination.

3.) Alberta’s primary energy regulator, the Energy Resources Conservation Board (ERCB), recently disclosed that the potential for hydraulic fracturing to contaminate useable water aquifers with fracturing fluid chemicals and natural gas is a real public issue, especially in shallow zones.

4.) On Wednesday morning, lawyers representing Jessica Ernst, a 54-year-old oil patch consultant, will release a 73-page statement of claim that alleges that EnCana broke multiple provincial laws and regulations and contaminated a shallow aquifer used by a rural community with natural gas and toxic industry-related chemicals.

5.) The claim methodically reports how Alberta’s two key groundwater...
regulators, Alberta Environment and the ERCB, “failed to follow the investigation and enforcement processes that they had established and publicized."

6.) The ERCB recently gave EnCana permission to drill and fracture more CBM wells above the base of groundwater protection near the affected water wells mentioned in this claim.

7.) The United Nations invited Jessica Ernst to present her story and make recommendations to governments at the 19th session of the Commission on Sustainable Development in New York next week.

8.) The claim represents assertions that have not yet been proven in court. All defendants will have the opportunity to respond in these proceedings.

Website: www.ernstversusencana.ca will go live at 10:00AM MTS on Wednesday.

BACKGROUND:

US Congress: Chemicals Used in Hydraulic Fracturing

University of Toronto and Munk School of Global Affairs Program on Water Issues:

Fracture Lines: Will Canada's water be protected in the rush to develop shale gas?

ERCB: Unconventional Gas Regulatory Framework

National Energy Board: Overview and Economics of Horseshoe Canyon Coalbed Methane Development

For further information:

Jessica Ernst
Email: ernst@telusplanet.net
Phone (excluding April 30 - May 7): 1-403-677-2074
From May 1 - 6:
LEO HOUSE. 332 W 23rd St
New York, NY 10011
(212) 366-0100

Murray Klippenstein (Legal Counsel)
Email: murray.klippenstein@klippensteins.ca
Phone: 1-416-937-8634 (Cell); 1-416-596-0288 (Office)

Cory Wanless (Legal Counsel)
Email: cory.wanless@klippensteins.ca
Phone: 1-647-886-1914 (Cell); 1-416-596-0288 (Office)
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From: "Graham Hutchinson,

To: <frac-review@gov.ns.ca>

Date: 2011-04-26 10:26 PM

Subject: Review of Hydraulic fracturing in NS


My first comment of the Review is that it assumes the long term effects of the process of hydraulic fracturing is known. The process is relatively new compared with traditional fracturing that used high viscosity fluids that has taken place since 1947. Hydro-fracturing is new and has been untested by time.

Secondly, the companies themselves do not know which chemicals they use (see comment below and attached Congressional Report) so how can the Review be conclusive if it does not know this information?

Thirdly, the Review is too narrow and does not take into account other environmental effects such as light, traffic, vibration and noise, nor of the wider issues of tourism and immigration.

My comments are in red below

effects on groundwater;

? use and effects on surface water;

? impacts on land, such as potential soil contamination;

To include investigations of potential seismic events and ground movement which may damage the cement casing

To include investigation of radioactivity hazard from uranium/radon

To include long term monitoring 50 years or more beyond life of the well

? waste management, including surface ponds of produced waters;

Around 800 -1200 trucks are used per well - to investigate effects of on the environment and roads

? identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids;

To include third party compounds and chemicals as highlighted in the Report to Congress (attached)

? site restoration; and

? financial security / insurance that operators are required to provide prior to conducting activity in the province.

The review to:

Also to include baseline testing of well water from all wells within a 10 mile radius of a well

Also to include light pollution

Also to include noise pollution

Also to include effect of vibration on shellfish spawning
Also to include effects of fish migration patterns

Also to include effects on tourism and immigration to NS

Regards

Graham Hutchinson
CHEMICALS USED IN HYDRAULIC FRACTURING

PREPARED BY COMMITTEE STAFF FOR:

Henry A. Waxman
Ranking Member
Committee on Energy and Commerce

Edward J. Markey
Ranking Member
Committee on Natural Resources

Diana DeGette
Ranking Member
Subcommittee on Oversight and Investigations
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I. EXECUTIVE SUMMARY

Hydraulic fracturing has helped to expand natural gas production in the United States, unlocking large natural gas supplies in shale and other unconventional formations across the country. As a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades. According to new estimates by the Energy Information Administration (EIA), the United States possesses natural gas resources sufficient to supply the United States for approximately 110 years.

As the use of hydraulic fracturing has grown, so have concerns about its environmental and public health impacts. One concern is that hydraulic fracturing fluids used to fracture rock formations contain numerous chemicals that could harm human health and the environment, especially if they enter drinking water supplies. The opposition of many oil and gas companies to public disclosure of the chemicals they use has compounded this concern.

Last Congress, the Committee on Energy and Commerce launched an investigation to examine the practice of hydraulic fracturing in the United States. As part of that inquiry, the Committee asked the 14 leading oil and gas service companies to disclose the types and volumes of the hydraulic fracturing products they used in their fluids between 2005 and 2009 and the chemical contents of those products. This report summarizes the information provided to the Committee.

Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products – not including water added at the well site – between 2005 and 2009.

Some of the components used in the hydraulic fracturing products were common and generally harmless, such as salt and citric acid. Some were unexpected, such as instant coffee and walnut hulls. And some were extremely toxic, such as benzene and lead. Appendix A lists each of the 750 chemicals and other components used in hydraulic fracturing products between 2005 and 2009.

The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of compounds containing the chemical, was methanol. Methanol, which was used in 342 hydraulic fracturing products, is a hazardous air pollutant and is on the candidate list for potential regulation under the Safe Drinking Water Act. Some of the other most widely used chemicals were isopropyl alcohol (used in 274 products), 2-butoxyethanol (used in 126 products), and ethylene glycol (used in 119 products).

Between 2005 and 2009, the oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals were components of more than 650 different products used in hydraulic fracturing.
The BTEX compounds—benzene, toluene, xylene, and ethylbenzene—appeared in 60 of the hydraulic fracturing products used between 2005 and 2009. Each BTEX compound is a regulated contaminant under the Safe Drinking Water Act and a hazardous air pollutant under the Clean Air Act. Benzene also is a known human carcinogen. The hydraulic fracturing companies injected 11.4 million gallons of products containing at least one BTEX chemical over the five year period.

In many instances, the oil and gas service companies were unable to provide the Committee with a complete chemical makeup of the hydraulic fracturing fluids they used. Between 2005 and 2009, the companies used 94 million gallons of 279 products that contained at least one chemical or component that the manufacturers deemed proprietary or a trade secret. Committee staff requested that these companies disclose this proprietary information. Although some companies did provide information about these proprietary fluids, in most cases the companies stated that they did not have access to proprietary information about products they purchased "off the shelf" from chemical suppliers. In these cases, the companies are injecting fluids containing chemicals that they themselves cannot identify.

II. BACKGROUND

Hydraulic fracturing—a method by which oil and gas service companies provide access to domestic energy trapped in hard-to-reach geologic formations—has been the subject of both enthusiasm and increasing environmental and health concerns in recent years. Hydraulic fracturing, used in combination with horizontal drilling, has allowed industry to access natural gas reserves previously considered uneconomical, particularly in shale formations. As a result of the growing use of hydraulic fracturing, natural gas production in the United States reached 21,577 billion cubic feet in 2010, a level not achieved since a period of high natural gas production between 1970 and 1974.\(^1\) Overall, the Energy Information Administration now projects that the United States possesses 2,552 trillion cubic feet of potential natural gas resources, enough to supply the United States for approximately 110 years. Natural gas from shale resources accounts for 827 trillion cubic feet of this total, which is more than double what the EIA estimated just a year ago.\(^2\)

Hydraulic fracturing creates access to more natural gas supplies, but the process requires the use of large quantities of water and fracturing fluids, which are injected underground at high volumes and pressure. Oil and gas service companies design fracturing fluids to create fractures and transport sand or other granular substances to prop open the fractures. The composition of these fluids varies by formation, ranging from a simple mixture of water and sand to more complex mixtures with a multitude of chemical additives. The companies may use these


chemical additives to thicken or thin the fluids, improve the flow of the fluid, or kill bacteria that can reduce fracturing performance.³

Some of these chemicals, if not disposed of safely or allowed to leach into the drinking water supply, could damage the environment or pose a risk to human health. During hydraulic fracturing, fluids containing chemicals are injected deep underground, where their migration is not entirely predictable. Well failures, such as the use of insufficient well casing, could lead to their release at shallower depths, closer to drinking water supplies.⁴ Although some fracturing fluids are removed from the well at the end of the fracturing process, a substantial amount remains underground.⁵

While most underground injections of chemicals are subject to the protections of the Safe Drinking Water Act (SDWA), Congress in 2005 modified the law to exclude “the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities” from the Act’s protections.⁶ Unless oil and gas service companies use diesel in the hydraulic fracturing process, the permanent underground injection of chemicals used for hydraulic fracturing is not regulated by the Environmental Protection Agency (EPA).

Concerns also have been raised about the ultimate outcome of chemicals that are recovered and disposed of as wastewater. This wastewater is stored in tanks or pits at the well site, where spills are possible.⁷ For final disposal, well operators must either recycle the fluids for use in future fracturing jobs, inject it into underground storage wells (which, unlike the fracturing process itself, are subject to the Safe Drinking Water Act), discharge it to nearby surface water, or transport it to wastewater treatment facilities.⁸ A recent report in the New York

³ U.S. Environmental Protection Agency, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004) (EPA 816-R-04-003) at 4-1 and 4-2.


⁶ 42 U.S.C. § 300h(d). Many dubbed this provision the “Halliburton loophole” because of Halliburton’s ties to then-Vice President Cheney and its role as one of the largest providers of hydraulic fracturing services. See The Halliburton Loophole, New York Times (Nov. 9, 2009).


Times raised questions about the safety of surface water discharge and the ability of water treatment facilities to process wastewater from natural gas drilling operations.\textsuperscript{9}

Any risk to the environment and human health posed by fracturing fluids depends in large part on their contents. Federal law, however, contains no public disclosure requirements for oil and gas producers or service companies involved in hydraulic fracturing, and state disclosure requirements vary greatly.\textsuperscript{10} While the industry has recently announced that it soon will create a public database of fluid components, reporting to this database is strictly voluntary, disclosure will not include the chemical identity of products labeled as proprietary, and there is no way to determine if companies are accurately reporting information for all wells.\textsuperscript{11}

The absence of a minimum national baseline for disclosure of fluids injected during the hydraulic fracturing process and the exemption of most hydraulic fracturing injections from regulation under the Safe Drinking Water Act has left an informational void concerning the contents, chemical concentrations, and volumes of fluids that go into the ground during fracturing operations and return to the surface in the form of wastewater. As a result, regulators and the public are unable effectively to assess any impact the use of these fluids may have on the environment or public health.

\section*{III. METHODOLOGY}

On February 18, 2010, the Committee commenced an investigation into the practice of hydraulic fracturing and its potential impact on water quality across the United States. This investigation built on work begun by Ranking Member Henry A. Waxman in 2007 as Chairman of the Committee on Oversight and Government Reform. The Committee initially sent letters to eight oil and gas service companies engaged in hydraulic fracturing in the United States. In May 2010, the Committee sent letters to six additional oil and gas service companies to assess a

\footnote{\textit{Regulation Lax as Gas Wells’ Tainted Water Hits Rivers}, New York Times (Feb. 26, 2011).}

\footnote{Wyoming, for example, recently enacted relatively strong disclosure regulations, requiring disclosure on a well-by-well basis and “for each stage of the well stimulation program,” “the chemical additives, compounds and concentrations or rates proposed to be mixed and injected.” \textit{See WCWR 055-000-003 Sec. 45}. Similar regulations became effective in Arkansas this year. \textit{See Arkansas Oil and Gas Commission Rule B-19}. In Wyoming, much of this information is, after an initial period of review, available to the public. \textit{See WCWR 055-000-003 Sec. 21}. Other states, however, do not insist on such robust disclosure. For instance, West Virginia has no disclosure requirements for hydraulic fracturing and expressly exempts fluids used during hydraulic fracturing from the disclosure requirements applicable to underground injection of fluids for purposes of waste storage. \textit{See W. Va. Code St. R. § 34-5-7}.}

broader range of industry practices.\textsuperscript{12} The February and May letters requested information on the type and volume of chemicals present in the hydraulic fracturing products that each company used in their fluids between 2005 and 2009.

The 14 oil and gas service companies that received the letter voluntarily provided substantial information to the Committee. As requested, the companies reported the names and volumes of the products they used during the five-year period.\textsuperscript{13} For each hydraulic fracturing product reported, the companies also provided a Material Safety Data Sheet (MSDS) detailing the product’s chemical components. The Occupational Safety and Health Administration (OSHA) requires chemical manufacturers to create a MSDS for every product they sell as a means to communicate potential health and safety hazards to employees and employers. The MSDS must list all hazardous ingredients if they comprise at least 1% of the product; for carcinogens, the reporting threshold is 0.1%.\textsuperscript{14}

Under OSHA regulations, manufacturers may withhold the identity of chemical components that constitute “trade secrets.”\textsuperscript{15} If the MSDS for a particular product used by a company subject to the Committee’s investigation reported that the identity of any chemical component was a trade secret, the Committee asked the company that used that product to provide the proprietary information, if available.

IV. HYDRAULIC FRACTURING FLUIDS AND THEIR CONTENTS

Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components.\textsuperscript{16} Overall, these companies used 780 million gallons of hydraulic fracturing products in their fluids between 2005 and 2009. This volume does not include water that the companies added to the fluids at the well site before injection. The products are comprised of a wide range of chemicals. Some are seemingly harmless like sodium chloride (salt), gelatin, and citric acid. Others could pose a severe risk to human health or the environment.

\textsuperscript{12} The Committee sent letters to Basic Energy Services, BJ Services, Calfrac Well Services, Complete Production Services, Frac Tech Services, Halliburton, Key Energy Services, RPC, Sanjel Corporation, Schlumberger, Superior Well Services, Trican Well Service, Universal Well Services, and Weatherford.

\textsuperscript{13} BJ Services, Halliburton, and Schlumberger already had provided the Oversight Committee with data for 2005 through 2007. For BJ Services, the 2005-2007 data is limited to natural gas wells. For Schlumberger, the 2005-2007 data is limited to coalbed methane wells.


\textsuperscript{15} 29 CFR 1910.1200.

\textsuperscript{16} Each hydraulic fracturing “product” is a mixture of chemicals or other components designed to achieve a certain performance goal, such as increasing the viscosity of water. Some oil and gas service companies create their own products; most purchase these products from chemical vendors. The service companies then mix these products together at the well site to formulate the hydraulic fracturing fluids that they pump underground.
Some of the components were surprising. One company told the Committee that it used instant coffee as one of the components in a fluid designed to inhibit acid corrosion. Two companies reported using walnut hulls as part of a breaker—a product used to degrade the fracturing fluid viscosity, which helps to enhance post-fracturing fluid recovery. Another company reported using carbohydrates as a breaker. One company used tallow soap—soap made from beef, sheep, or other animals—to reduce loss of fracturing fluid into the exposed rock.

Appendix A lists each of the 750 chemicals and other components used in the hydraulic fracturing products injected underground between 2005 and 2009.

A. Commonly Used Chemical Components

The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of products containing the chemical, was methanol. Methanol is a hazardous air pollutant and a candidate for regulation under the Safe Drinking Water Act. It was a component in 342 hydraulic fracturing products. Some of the other most widely used chemicals include isopropyl alcohol, which was used in 274 products, and ethylene glycol, which was used in 119 products. Crystalline silica (silicon dioxide) appeared in 207 products, generally proppants used to hold open fractures. Table 1 has a list of the most commonly used compounds in hydraulic fracturing fluids.

<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (Methyl alcohol)</td>
<td>342</td>
</tr>
<tr>
<td>Isopropanol (Isopropyl alcohol, Propan-2-ol)</td>
<td>274</td>
</tr>
<tr>
<td>Crystalline silica - quartz (SiO2)</td>
<td>207</td>
</tr>
<tr>
<td>Ethylene glycol monobutyl ether (2-hutoxyethanol)</td>
<td>126</td>
</tr>
<tr>
<td>Ethylene glycol (1,2-ethanediol)</td>
<td>119</td>
</tr>
<tr>
<td>Hydrotreated light petroleum distillates</td>
<td>89</td>
</tr>
<tr>
<td>Sodium hydroxide (Caustic soda)</td>
<td>80</td>
</tr>
</tbody>
</table>
Hydraulic fracturing companies used 2-butoxyethanol (2-BE) as a foaming agent or surfactant in 126 products. According to EPA scientists, 2-BE is easily absorbed and rapidly distributed in humans following inhalation, ingestion, or dermal exposure. Studies have shown that exposure to 2-BE can cause hemolysis (destruction of red blood cells) and damage to the spleen, liver, and bone marrow. The hydraulic fracturing companies injected 21.9 million gallons of products containing 2-BE between 2005 and 2009. They used the highest volume of products containing 2-BE in Texas, which accounted for more than half of the volume used. EPA recently found this chemical in drinking water wells tested in Pavillion, Wyoming. Table 2 shows the use of 2-BE by state.

<table>
<thead>
<tr>
<th>State</th>
<th>Fluid Volume (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>12,031,734</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>2,186,613</td>
</tr>
<tr>
<td>New Mexico</td>
<td>1,871,501</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,147,614</td>
</tr>
<tr>
<td>Louisiana</td>
<td>890,068</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>747,416</td>
</tr>
<tr>
<td>West Virginia</td>
<td>464,231</td>
</tr>
<tr>
<td>Utah</td>
<td>382,874</td>
</tr>
<tr>
<td>Montana</td>
<td>362,497</td>
</tr>
<tr>
<td>Arkansas</td>
<td>348,959</td>
</tr>
</tbody>
</table>

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B. Toxic Chemicals

The oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals were components of 652 different products used in hydraulic fracturing. Table 3 lists these toxic chemicals and their frequency of use.

<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>Chemical Category</th>
<th>No. of Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (Methyl alcohol)</td>
<td>HAP</td>
<td>342</td>
</tr>
<tr>
<td>Ethylene glycol (1,2-ethanediol)</td>
<td>HAP</td>
<td>119</td>
</tr>
<tr>
<td>Diesel</td>
<td>Carcinogen, SDWA, HAP</td>
<td>51</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>Carcinogen, HAP</td>
<td>44</td>
</tr>
<tr>
<td>Xylene</td>
<td>SDWA, HAP</td>
<td>44</td>
</tr>
<tr>
<td>Hydrogen chloride (Hydrochloric acid)</td>
<td>HAP</td>
<td>42</td>
</tr>
<tr>
<td>Toluene</td>
<td>SDWA, HAP</td>
<td>29</td>
</tr>
<tr>
<td>Ethylbenzene</td>
<td>SDWA, HAP</td>
<td>28</td>
</tr>
<tr>
<td>Diethanolamine (2,2-iminodietanol)</td>
<td>HAP</td>
<td>14</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Carcinogen, HAP</td>
<td>12</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>Carcinogen</td>
<td>9</td>
</tr>
<tr>
<td>Thiourea</td>
<td>Carcinogen</td>
<td>9</td>
</tr>
<tr>
<td>Benzyl chloride</td>
<td>Carcinogen, HAP</td>
<td>8</td>
</tr>
<tr>
<td>Cumene</td>
<td>HAP</td>
<td>6</td>
</tr>
<tr>
<td>Nizilolthioacetate acid</td>
<td>Carcinogen</td>
<td>6</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
<td>HAP</td>
<td>5</td>
</tr>
<tr>
<td>Phenol</td>
<td>HAP</td>
<td>5</td>
</tr>
<tr>
<td>Benzene</td>
<td>Carcinogen, SDWA, HAP</td>
<td>3</td>
</tr>
<tr>
<td>Di(2-ethylhexyl) phthalate</td>
<td>Carcinogen, SDWA, HAP</td>
<td>3</td>
</tr>
<tr>
<td>Acrylamide</td>
<td>Carcinogen, SDWA, HAP</td>
<td>2</td>
</tr>
<tr>
<td>Hydrogen fluoride (Hydrofluoric acid)</td>
<td>HAP</td>
<td>2</td>
</tr>
<tr>
<td>Phthalic anhydride</td>
<td>HAP</td>
<td>2</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>Carcinogen</td>
<td>1</td>
</tr>
<tr>
<td>Acetophenone</td>
<td>HAP</td>
<td>1</td>
</tr>
<tr>
<td>Copper</td>
<td>SDWA</td>
<td>1</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>Carcinogen</td>
<td>1</td>
</tr>
<tr>
<td>Lead</td>
<td>Carcinogen, SDWA, HAP</td>
<td>1</td>
</tr>
<tr>
<td>Propylene oxide</td>
<td>Carcinogen</td>
<td>1</td>
</tr>
<tr>
<td>p-Xylene</td>
<td>HAP</td>
<td>1</td>
</tr>
</tbody>
</table>

---

19 According to EPA, diesel contains benzene, toluene, ethylbenzene, and xylenes. See EPA, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coolbed Methane Reservoirs (June 2004) (EPA 816-R-04-003) at 4-11.
1. Carcinogens

Between 2005 and 2009, the hydraulic fracturing companies used 95 products containing 13 different carcinogens.\textsuperscript{20} These included naphthalene (a possible human carcinogen), benzene (a known human carcinogen), and acrylamide (a probable human carcinogen). Overall, these companies injected 10.2 million gallons of fracturing products containing at least one carcinogen. The companies used the highest volume of fluids containing one or more carcinogens in Texas, Colorado, and Oklahoma. Table 4 shows the use of these chemicals by state.

<table>
<thead>
<tr>
<th>State</th>
<th>Fluid Volume (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>3,877,273</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,544,388</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>1,098,746</td>
</tr>
<tr>
<td>Louisiana</td>
<td>777,945</td>
</tr>
<tr>
<td>Wyoming</td>
<td>759,898</td>
</tr>
<tr>
<td>North Dakota</td>
<td>557,519</td>
</tr>
<tr>
<td>New Mexico</td>
<td>511,186</td>
</tr>
<tr>
<td>Montana</td>
<td>394,873</td>
</tr>
<tr>
<td>Utah</td>
<td>382,338</td>
</tr>
</tbody>
</table>

2. Safe Drinking Water Act Chemicals

Under the Safe Drinking Water Act, EPA regulates 53 chemicals that may have an adverse effect on human health and are known to or likely to occur in public drinking water systems at levels of public health concern. Between 2005 and 2009, the hydraulic fracturing companies used 67 products containing at least one of eight SDWA-regulated chemicals. Overall, they injected 11.7 million gallons of fracturing products containing at least one chemical regulated under SDWA. Most of these chemicals were injected in Texas. Table 5 shows the use of these chemicals by state.

\textsuperscript{20} For purposes of this report, a chemical is considered a “carcinogen” if it is on one of two lists: (1) substances identified by the National Toxicology Program as “known to be human carcinogens” or as “reasonably anticipated to be human carcinogens”; and (2) substances identified by the International Agency for Research on Cancer, part of the World Health Organization, as “carcinogenic” or “probably carcinogenic” to humans. See U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, \textit{Report on Carcinogens, Eleventh Edition} (Jan. 31, 2005) and World Health Organization, International Agency for Research on Cancer, \textit{Agents Classified by the IARC Monographs} (online at http://monographs.iarc.fr/ENG/Classification/index.php) (accessed Feb. 28, 2011).
The vast majority of these SDWA-regulated chemicals were the BTEX compounds—benzene, toluene, xylene, and ethylbenzene. The BTEX compounds appeared in 60 hydraulic fracturing products used between 2005 and 2009 and were used in 11.4 million gallons of hydraulic fracturing fluids. The Department of Health and Human Services, the International Agency for Research on Cancer, and EPA have determined that benzene is a human carcinogen.\textsuperscript{21} Chronic exposure to toluene, ethylbenzene, or xylenes also can damage the central nervous system, liver, and kidneys.\textsuperscript{22}

<table>
<thead>
<tr>
<th>State</th>
<th>Fluid Volume (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>9,474,631</td>
</tr>
<tr>
<td>New Mexico</td>
<td>1,157,721</td>
</tr>
<tr>
<td>Colorado</td>
<td>375,817</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>202,562</td>
</tr>
<tr>
<td>Mississippi</td>
<td>108,809</td>
</tr>
<tr>
<td>North Dakota</td>
<td>100,479</td>
</tr>
</tbody>
</table>

Table 5. States with at Least 100,000 Gallons of Hydraulic Fracturing Fluids Containing a SDWA-Regulated Chemical (2005-2009)

In addition, the hydraulic fracturing companies injected more than 30 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states.\textsuperscript{23} In a 2004 report, EPA stated that the “use of diesel fuel in fracturing fluids poses the greatest threat” to underground sources of drinking water.\textsuperscript{24} Diesel fuel contains toxic constituents, including BTEX compounds.\textsuperscript{25}

EPA also has created a Candidate Contaminant List (CCL), which is a list of contaminants that are currently not subject to national primary drinking water regulations but are known or anticipated to occur in public water systems and may require regulation under the Safe Drinking Water Act in the future.\textsuperscript{26} Nine chemicals on that list—1-butanol, acetaldehyde, benzyl


\textsuperscript{22} EPA, \textit{Basic Information about Toluene in Drinking Water, Basic Information about Ethylbenzene in Drinking Water, and Basic Information about Xylenes in Drinking Water} (online at http://water.epa.gov/drink/contaminants/basicinformation/index.cfm) (accessed Oct. 14, 2010).


\textsuperscript{24} EPA, \textit{Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs} (June 2004) (EPA 816-R-04-003) at 4-11.

\textsuperscript{25} Id.

chloride, ethylene glycol, ethylene oxide, formaldehyde, methanol, n-methyl-2-pyrrolidone, and propylene oxide—were used in hydraulic fracturing products between 2005 and 2009.

3. **Hazardous Air Pollutants**

The Clean Air Act requires EPA to control the emission of 187 hazardous air pollutants, which are pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. Between 2005 and 2009, the hydraulic fracturing companies used 595 products containing 24 different hazardous air pollutants.

Hydrogen fluoride is a hazardous air pollutant that is a highly corrosive and systemic poison that causes severe and sometimes delayed health effects due to deep tissue penetration. Absorption of substantial amounts of hydrogen fluoride by any route may be fatal. One of the hydraulic fracturing companies used 67,222 gallons of two products containing hydrogen fluoride in 2008 and 2009.

Lead is a hazardous air pollutant that is a heavy metal that is particularly harmful to children’s neurological development. It also can cause health problems in adults, including reproductive problems, high blood pressure, and nerve disorders. One of the hydraulic fracturing companies used 780 gallons of a product containing lead in this five-year period.

Methanol is the hazardous air pollutant that appeared most often in hydraulic fracturing products. Other hazardous air pollutants used in hydraulic fracturing fluids included formaldehyde, hydrogen chloride, and ethylene glycol.

V. **USE OF PROPRIETARY AND “TRADE SECRET” CHEMICALS**

Many chemical components of hydraulic fracturing fluids used by the companies were listed on the MSDSs as “proprietary” or “trade secret.” The hydraulic fracturing companies used 93.6 million gallons of 279 products containing at least one proprietary component between 2005 and 2009.\(^{30}\)

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\(^{27}\) Clean Air Act Section 112(b), 42 U.S.C. § 7412.


\(^{30}\) This is likely a conservative estimate. We included only those products for which the MSDS says “proprietary” or “trade secret” instead of listing a component by name or providing the CAS number. If the MSDS listed a component’s CAS as N.A. or left it blank, we did not count that as a trade secret claim, unless the company specified as such in follow-up correspondence.
The Committee requested that these companies disclose this proprietary information. Although a few companies were able to provide additional information to the Committee about some of the fracturing products, in most cases the companies stated that they did not have access to proprietary information about products they purchased “off the shelf” from chemical suppliers. The proprietary information belongs to the suppliers, not the users of the chemicals.

Universal Well Services, for example, told the Committee that it “obtains hydraulic fracturing products from third-party manufacturers, and to the extent not publicly disclosed, product composition is proprietary to the respective vendor and not to the Company.” Complete Production Services noted that the company always uses fluids from third-party suppliers who provide an MSDS for each product. Complete confirmed that it is “not aware of any circumstances in which the vendors who provided the products have disclosed this proprietary information” to the company, further noting that “such information is highly proprietary for these vendors, and would not generally be disclosed to service providers” like Complete. Key Energy Services similarly stated that it “generally does not have access to the trade secret information as a purchaser of the chemical(s).” Trican also told the Committee that it has limited knowledge of “off the shelf” products purchased from a chemical distributor or manufacturer, noting that “Trican does not have any information in its possession about the components of such products beyond what the distributor of each product provided Trican in the MSDS sheet.”

In these cases, it appears that the companies are injecting fluids containing unknown chemicals about which they may have limited understanding of the potential risks posed to human health and the environment.

VI. CONCLUSION

Hydraulic fracturing has opened access to vast domestic reserves of natural gas that could provide an important stepping stone to a clean energy future. Yet questions about the safety of hydraulic fracturing persist, which are compounded by the secrecy surrounding the chemicals used in hydraulic fracturing fluids. This analysis is the most comprehensive national assessment to date of the types and volumes of chemical used in the hydraulic fracturing process. It shows that between 2005 and 2009, the 14 leading hydraulic fracturing companies in the United States used over 2,500 hydraulic fracturing products containing 750 compounds. More than 650 of these products contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or listed as hazardous air pollutants.

33 E-mail from Peter Spivack to Committee Staff (Aug. 5, 2010).
34 E-mail from Lee Blalack to Committee Staff (July 29, 2010).
### Appendix A. Chemical Components of Hydraulic Fracturing Products, 2005-2009

<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>CAS Number</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-(1-naphthylmethyl)quinolinium chloride</td>
<td>65322-65-8</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3-propanetricarboxylic acid, 2-hydroxy-, trisodium salt, dihydrate</td>
<td>6132-04-3</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3-trimethylbenzene</td>
<td>526-73-8</td>
<td>1</td>
</tr>
<tr>
<td>1,2,4-trimethylbenzene</td>
<td>95-63-6</td>
<td>21</td>
</tr>
<tr>
<td>1,2-benzisothiazol-4</td>
<td>2634-33-5</td>
<td>1</td>
</tr>
<tr>
<td>1,2-dibromo-2,4-dicyanobutane</td>
<td>35691-65-7</td>
<td>1</td>
</tr>
<tr>
<td>1,2-ethanediaminium, N, N'-bis[2-[bis(2-hydroxyethyl)methylammonio]ethyl]-N,N'-bis(2-hydroxyethyl)-N,N'-dimethyl-,tetrachloride</td>
<td>138879-94-4</td>
<td>2</td>
</tr>
<tr>
<td>1,3,5-trimethylbenzene</td>
<td>108-67-8</td>
<td>3</td>
</tr>
<tr>
<td>1,6-hexanediamine dihydrochloride</td>
<td>6055-52-3</td>
<td>1</td>
</tr>
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<td>1,8-diamino-3,6-dioxoactone</td>
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To compile this list of chemicals, Committee staff reviewed each Material Safety Data Sheet provided to the Committee for hydraulic fracturing products used between 2005 and 2009. Committee staff transcribed the names and CAS numbers as written in the MSDSs; as such, any inaccuracies on this list reflect inaccuracies on the MSDSs themselves.
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<tr>
<td>Tar bases, quinoline derivatives, benzyl chloride-quaternized</td>
<td>72480-70-7</td>
<td>5</td>
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<td>Tergitol</td>
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<td>Terpene hydrocarbon byproducts</td>
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<tr>
<td>Terpenes and terpenoids, sweet orange-oil</td>
<td>68647-72-3</td>
<td>2</td>
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<tr>
<td>Terpineol</td>
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<td>Tert-butyl hydroperoxide</td>
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<td>(Dazomet)</td>
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<tr>
<td>Tetrakis (hydroxymethyl) phosphonium sulfate</td>
<td>55566-30-8</td>
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<tr>
<td>Tetrannethy ammonium chloride</td>
<td>75-57-0</td>
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<tr>
<td>Tetrasodium 1-hydroxyethylidene-1,1-diphosphonic acid</td>
<td>3794-83-0</td>
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<td>Tetrasodium ethylenediaminetetraacetate</td>
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<td>Thiocyanate sodium</td>
<td>540-72-7</td>
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<td>Thiglycolic acid</td>
<td>68-11-1</td>
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<td>Thiourea</td>
<td>62-56-6</td>
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<td>Thiourea polymer</td>
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<td>Treated ammonium chloride (with anti-caking agent a or b)</td>
<td>12125-02-9</td>
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<td>Tributyl tetracetyl phosphonium chloride</td>
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<td>Tri-calcium silicate</td>
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<td>Tridecyl alcohol</td>
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<td>Triethanolamine titanate</td>
<td>36673-16-2</td>
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<tr>
<td>Triethanolamine zirconate</td>
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<tr>
<td>Triethanolamine zirconium chelate</td>
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<tr>
<td>Triethyl citrate</td>
<td>77-93-0</td>
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<td>Triethyl phosphate</td>
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<td>Triethylene glycol</td>
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<td>Trisopropanolamine</td>
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<td>Trimethylbenzene</td>
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<tr>
<td>Trinethyloctadecylammonium (1-octadecanaminium, N,N,N-trimethyl-, chloride)</td>
<td>112-03-8</td>
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<tr>
<td>Tris(hydroxymethyl)aminomethane</td>
<td>77-86-1</td>
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<td>Trisodium ethylenediaminetetraacetate</td>
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<td>Trisodium ethylenediaminetriacetate</td>
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<td>Trisodium nitrotriacetate</td>
<td>18662-53-8</td>
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<td>Trisodium nitrotriacetate (Nitrilotriacetic acid, trisodium salt monohydrate)</td>
<td>5064-31-3</td>
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<td>Trisodium ortho phosphate</td>
<td>7601-54-9</td>
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<td>Trisodium phosphate dodecahydrate</td>
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<tr>
<td>Wall material</td>
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<tr>
<td>Walnut hulls</td>
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<td>White mineral oil</td>
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<td>8</td>
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<tr>
<td>Xanthan gum</td>
<td>11138-66-2</td>
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<tr>
<td>Xylene</td>
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<td>Zinc chloride</td>
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<td>Zinc oxide</td>
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<td>2</td>
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<tr>
<td>Zirconium complex</td>
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<tr>
<td>Zirconium dichloride oxide</td>
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<tr>
<td>Zirconium oxide sulfide</td>
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</tr>
<tr>
<td>Zirconium sodium hydroxy lactate complex (Sodium zirconium lactate)</td>
<td>113184-20-6</td>
<td>2</td>
</tr>
</tbody>
</table>

* Components marked with an asterisk appeared on at least one MSDS without an identifying CAS number. The MSDSs in these cases marked the CAS as proprietary, noted that the CAS was not available, or left the CAS field blank. Components marked with an asterisk may be duplicative of other components on this list, but Committee staff have no way of identifying such duplicates without the identifying CAS number.
In addition to the proposed scope of hydrofracking review by the Nova Scotia government I suggest the following augmentations:

1. Potential for air pollution
2. Risk of sour gas release
3. Worker and community safety
4. Risk of shale gas drilling rig fires
5. Risk of fires and accidents of trucks carrying hazardous fracking fluids
6. Impact on local food production in addition to the effect of soil contamination
7. Propose a reasonable standard which, if not possible to meet, would provide cause to ban hydrofracking in Nova Scotia
From: Cliff Esler
To: <frac-review@gov.ns.ca>
Date: 2011-04-28 7:17 PM
Subject: Comment: potential environmental issues

Data for consideration

This will no doubt be mentioned by others, but recent data that are highly relevant to the review process can be found in a new Cornell University study detailing the excessive methane component of hydraulic fracturing effects on the environment. The text of the Cornell abstract can be found at:


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Clifford M. Esler
Methane and the greenhouse-gas footprint of natural gas from shale formations

A letter

Robert W. Howarth · Renee Santoro · Anthony Ingraffea

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Abstract We evaluate the greenhouse gas footprint of natural gas obtained by high-volume hydraulic fracturing from shale formations, focusing on methane emissions. Natural gas is composed largely of methane, and 3.6% to 7.9% of the methane from shale-gas production escapes to the atmosphere in venting and leaks over the lifetime of a well. These methane emissions are at least 30% more than and perhaps more than twice as great as those from conventional gas. The higher emissions from shale gas occur at the time wells are hydraulically fractured—as methane escapes from flow-back return fluids—and during drill out following the fracturing. Methane is a powerful greenhouse gas, with a global warming potential that is far greater than that of carbon dioxide, particularly over the time horizon of the first few decades following emission. Methane contributes substantially to the greenhouse gas footprint of shale gas on shorter time scales, dominating it on a 20-year time horizon. The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years. Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years.

Keywords Methane · Greenhouse gases · Global warming · Natural gas · Shale gas · Unconventional gas · Fugitive emissions · Lifecycle analysis · LCA · Bridge fuel · Transitional fuel · Global warming potential · GWP

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Many view natural gas as a transitional fuel, allowing continued dependence on fossil fuels yet reducing greenhouse gas (GHG) emissions compared to oil or coal over coming decades (Pacala and Socolow 2004). Development of “unconventional” gas disperses in shale is part of this vision, as the potential resource may be large, and in many regions conventional reserves are becoming depleted (Wood et al. 2011). Domestic production in the U.S. was predominantly from conventional reservoirs through the 1990s, but by 2009 U.S. unconventional production exceeded that of conventional gas. The Department of Energy predicts that by 2035 total domestic production will grow by 20%, with unconventional gas providing 75% of the total (EIA 2010a). The greatest growth is predicted for shale gas, increasing from 16% of total production in 2009 to an expected 45% in 2035.

Although natural gas is promoted as a bridge fuel over the coming few decades, in part because of its presumed benefit for global warming compared to other fossil fuels, very little is known about the GHG footprint of unconventional gas. Here, we define the GHG footprint as the total GHG emissions from developing and using the gas, expressed as equivalents of carbon dioxide, per unit of energy obtained during combustion. The GHG footprint of shale gas has received little study or scrutiny, although many have voiced concern. The National Research Council (2009) noted emissions from shale-gas extraction may be greater than from conventional gas. The Council of Scientific Society Presidents (2010) wrote to President Obama, warning that some potential energy bridges such as shale gas have received insufficient analysis and may aggravate rather than mitigate global warming. And in late 2010, the U.S. Environmental Protection Agency issued a report concluding that fugitive emissions of methane from unconventional gas may be far greater than for conventional gas (EPA 2010).

Fugitive emissions of methane are of particular concern. Methane is the major component of natural gas and a powerful greenhouse gas. As such, small leakages are important. Recent modeling indicates methane has an even greater global warming potential than previously believed, when the indirect effects of methane on atmospheric aerosols are considered (Shindell et al. 2009). The global methane budget is poorly constrained, with multiple sources and sinks all having large uncertainties. The radiocarbon content of atmospheric methane suggests fossil fuels may be a far larger source of atmospheric methane than generally thought (Lassey et al. 2007).

The GHG footprint of shale gas consists of the direct emissions of CO2 from end-use consumption, indirect emissions of CO2 from fossil fuels used to extract, develop, and transport the gas, and methane fugitive emissions and venting. Despite the high level of industrial activity involved in developing shale gas, the indirect emissions of CO2 are relatively small compared to those from the direct combustion of the fuel: 1 to 1.5 g C MJ⁻¹ (Santoro et al. 2011) vs 15 g C MJ⁻¹ for direct emissions (Hayhoe et al. 2002). Indirect emissions from shale gas are estimated to be only 0.04 to 0.45 g C MJ⁻¹ greater than those for conventional gas (Wood et al. 2011). Thus, for both conventional and shale gas, the GHG footprint is dominated by the direct CO2 emissions and fugitive methane emissions. Here we present estimates for methane emissions as contributors to the GHG footprint of shale gas compared to conventional gas.

Our analysis uses the most recently available data, relying particularly on a technical background document on GHG emissions from the oil and gas industry (EPA 2010) and materials discussed in that report, and a report on natural gas losses on federal lands from the General Accountability Office (GAO 2010). The
EPA (2010) report is the first update on emission factors by the agency since 1996 (Harrison et al. 1996). The earlier report served as the basis for the national GHG inventory for the past decade. However, that study was not based on random sampling or a comprehensive assessment of actual industry practices, but rather only analyzed facilities of companies that voluntarily participated (Kirchgessner et al. 1997). The new EPA (2010) report notes that the 1996 “study was conducted at a time when methane emissions were not a significant concern in the discussion about GHG emissions” and that emission factors from the 1996 report “are outdated and potentially understated for some emissions sources.” Indeed, emission factors presented in EPA (2010) are much higher, by orders of magnitude for some sources.

1 Fugitive methane emissions during well completion

Shale gas is extracted by high-volume hydraulic fracturing. Large volumes of water are forced under pressure into the shale to fracture and re-fracture the rock to boost gas flow. A significant amount of this water returns to the surface as flow-back within the first few days to weeks after injection and is accompanied by large quantities of methane (EPA 2010). The amount of methane is far more than could be dissolved in the flow-back fluids, reflecting a mixture of fracture-return fluids and methane gas. We have compiled data from 2 shale gas formations and 3 tight-sand gas formations in the U.S. Between 0.6% and 3.2% of the life-time production of gas from wells is emitted as methane during the flow-back period (Table 1). We include tight-sand formations since flow-back emissions and the patterns of gas production over time are similar to those for shale (EPA 2010). Note that the rate of methane emitted during flow-back (column B in Table 1) correlates well to the initial production rate for the well following completion (column C in Table 1). Although the data are limited, the variation across the basins seems reasonable: the highest methane emissions during flow-back were in the Haynesville, where initial pressures and initial production were very high, and the lowest emissions were in the Uinta, where the flow-back period was the shortest and initial production following well completion was low. However, we note that the data used in Table 1 are not well documented, with many values based on PowerPoint slides from EPA-sponsored workshops. For this paper, we therefore choose to represent gas losses from flow-back fluids as the mean value from Table 1: 1.6%.

More methane is emitted during “drill-out,” the stage in developing unconventional gas in which the plugs set to separate fracturing stages are drilled out to release gas for production. EPA (2007) estimates drill-out emissions at $142 \times 10^3$ to $425 \times 10^3$ m$^3$ per well. Using the mean drill-out emissions estimate of $280 \times 10^3$ m$^3$ (EPA 2007) and the mean life-time gas production for the 5 formations in Table 1 ($85 \times 10^6$ m$^3$), we estimate that 0.33% of the total life-time production of wells is emitted as methane during the drill-out stage. If we instead use the average life-time production for a larger set of data on 12 formations (Wood et al. 2011), $45 \times 10^6$ m$^3$, we estimate a percentage emission of 0.62%. More effort is needed to determine drill-out emissions on individual formation. Meanwhile, in this paper we use the conservative estimate of 0.33% for drill-out emissions.

Combining losses associated with flow-back fluids (1.6%) and drill out (0.33%), we estimate that 1.9% of the total production of gas from an unconventional shale-gas
Table 1 Methane emissions during the flow-back period following hydraulic fracturing, initial gas production rates following well completion, life-time gas production of wells, and the methane emitted during flow-back expressed as a percentage of the life-time production for five unconventional wells in the United States

<table>
<thead>
<tr>
<th>Well Location</th>
<th>(A) Methane emitted during flow-back (10^3 m^3)^a</th>
<th>(B) Methane emitted per day during flow-back (10^3 m^3 day^-1)^b</th>
<th>(C) Initial gas production at well completion (10^3 m^3 day^-1)^c</th>
<th>(D) Life-time production of well (10^6 m^3)^d</th>
<th>(E) Methane emitted during flow-back as % of life-time production^e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haynesville (Louisiana, shale)</td>
<td>6,800</td>
<td>680</td>
<td>640</td>
<td>210</td>
<td>3.2</td>
</tr>
<tr>
<td>Barnett (Texas, shale)</td>
<td>370</td>
<td>41</td>
<td>37</td>
<td>35</td>
<td>1.1</td>
</tr>
<tr>
<td>Piceance (Colorado, tight sand)</td>
<td>710</td>
<td>79</td>
<td>57</td>
<td>55</td>
<td>1.3</td>
</tr>
<tr>
<td>Uinta (Utah, tight sand)</td>
<td>255</td>
<td>51</td>
<td>42</td>
<td>40</td>
<td>0.6</td>
</tr>
<tr>
<td>Denver-Julesburg (Colorado, tight sand)</td>
<td>140</td>
<td>12</td>
<td>11</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

Flow-back is the return of hydraulic fracturing fluids to the surface immediately after fracturing and before well completion. For these wells, the flow-back period ranged from 5 to 12 days.


^bCalculated by dividing the total methane emitted during flow-back (column A) by the duration of flow-back. Flow-back durations were 9 days for Barnett (EPA 2004), 8 days for Piceance (EPA 2007), 5 days for Uinta (Samuels 2010), and 12 days for Denver-Julesburg (Bracken 2008); median value of 10 days for flow-back was assumed for Haynesville


^eCalculated by dividing column (A) by column (D)
Climatic Change

Table 2 Fugitive methane emissions associated with development of natural gas from conventional wells and from shale formations (expressed as the percentage of methane produced over the lifecycle of a well)

<table>
<thead>
<tr>
<th></th>
<th>Conventional gas</th>
<th>Shale gas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emissions during well completion</td>
<td>0.01%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Routine venting and equipment leaks at well site</td>
<td>0.3 to 1.9%</td>
<td>0.3 to 1.9%</td>
</tr>
<tr>
<td>Emissions during liquid unloading</td>
<td>0 to 0.26%</td>
<td>0 to 0.26%</td>
</tr>
<tr>
<td>Emissions during gas processing</td>
<td>0 to 0.19%</td>
<td>0 to 0.19%</td>
</tr>
<tr>
<td>Emissions during transport, storage, and distribution</td>
<td>1.4 to 3.6%</td>
<td>1.4 to 3.6%</td>
</tr>
<tr>
<td>Total emissions</td>
<td>1.7 to 6.0%</td>
<td>3.6 to 7.9%</td>
</tr>
</tbody>
</table>

See text for derivation of estimates and supporting information

well is emitted as methane during well completion (Table 2). Again, this estimate is uncertain but conservative.

Emissions are far lower for conventional natural gas wells during completion, since conventional wells have no flow-back and no drill out. An average of $1.04 \times 10^3$ m³ of methane is released per well completed for conventional gas (EPA 2010), corresponding to $1.32 \times 10^3$ m³ natural gas (assuming 78.8% methane content of the gas). In 2007, 19,819 conventional wells were completed in the US (EPA 2010), so we estimate a total national emission of $26 \times 10^6$ m³ natural gas. The total national production of onshore conventional gas in 2007 was $384 \times 10^9$ m³ (EIA 2010b). Therefore, we estimate the average fugitive emissions at well completion for conventional gas as 0.01% of the life-time production of a well (Table 2), three orders of magnitude less than for shale gas.

2 Routine venting and equipment leaks

After completion, some fugitive emissions continue at the well site over its lifetime. A typical well has 55 to 150 connections to equipment such as heaters, meters, dehydrators, compressors, and vapor-recovery apparatus. Many of these potentially leak, and many pressure relief valves are designed to purposefully vent gas. Emissions from pneumatic pumps and dehydrators are a major part of the leakage (GAO 2010). Once a well is completed and connected to a pipeline, the same technologies are used for both conventional and shale gas; we assume that these post-completion fugitive emissions are the same for shale and conventional gas. GAO (2010) concluded that 0.3% to 1.9% of the life-time production of a well is lost due to routine venting and equipment leaks (Table 2). Previous studies have estimated routine well-site fugitive emissions as approximately 0.5% or less (Hayhoe et al. 2002; Armendariz 2009) and 0.95% (Shires et al. 2009). Note that none of these estimates include accidents or emergency vents. Data on emissions during emergencies are not available and have never, as far as we can determine, been used in any estimate of emissions from natural gas production. Thus, our estimate of 0.3% to 1.9% leakage is conservative. As we discuss below, the 0.3% reflects use of best available technology.

Additional venting occurs during “liquid unloading.” Conventional wells frequently require multiple liquid-unloading events as they mature to mitigate water intrusion as reservoir pressure drops. Though not as common, some unconventional wells may also require unloading. Empirical data from 4 gas basins indicate that 0.02
to 0.26% of total life-time production of a well is vented as methane during liquid unloading (GAO 2010). Since not all wells require unloading, we set the range at 0 to 0.26% (Table 2).

3 Processing losses

Some natural gas, whether conventional or from shale, is of sufficient quality to be “pipeline ready” without further processing. Other gas contains sufficient amounts of heavy hydrocarbons and impurities such as sulfur gases to require removal through processing before the gas is piped. Note that the quality of gas can vary even within a formation. For example, gas from the Marcellus shale in northeastern Pennsylvania needs little or no processing, while gas from southwestern Pennsylvania must be processed (NYDEC 2009). Some methane is emitted during this processing. The default EPA facility-level fugitive emission factor for gas processing indicates a loss of 0.19% of production (Shires et al. 2009). We therefore give a range of 0% (i.e. no processing, for wells that produce “pipeline ready” gas) to 0.19% of gas produced as our estimate of processing losses (Table 2). Actual measurements of processing plant emissions in Canada showed fourfold greater leakage than standard emission factors of the sort used by Shires et al. (2009) would indicate (Chambers 2004), so again, our estimates are very conservative.

4 Transport, storage, and distribution losses

Further fugitive emissions occur during transport, storage, and distribution of natural gas. Direct measurements of leakage from transmission are limited, but two studies give similar leakage rates in both the U.S. (as part of the 1996 EPA emission factor study, mean value of 0.53%; Harrison et al. 1996; Kirchgessner et al. 1997) and in Russia (0.7% mean estimate, with a range of 0.4% to 1.6%; Lelieveld et al. 2005). Direct estimates of distribution losses are even more limited, but the 1996 EPA study estimates losses at 0.35% of production (Harrison et al. 1996; Kirchgessner et al. 1997). Lelieveld et al. (2005) used the 1996 emission factors for natural gas storage and distribution together with their transmission estimates to suggest an overall average loss rate of 1.4% (range of 1.0% to 2.5%). We use this 1.4% leakage as the likely lower limit (Table 2). As noted above, the EPA 1996 emission estimates are based on limited data, and Revkin and Krauss (2009) reported “government scientists and industry officials caution that the real figure is almost certainly higher.” Furthermore, the IPCC (2007) cautions that these “bottom-up” approaches for methane inventories often underestimate fluxes.

Another way to estimate pipeline leakage is to examine “lost and unaccounted for gas,” e.g. the difference between the measured volume of gas at the wellhead and that actually purchased and used by consumers. At the global scale, this method has estimated pipeline leakage at 2.5% to 10% (Crutzen 1987; Cicerone and Oremland 1988; Hayhoe et al. 2002), although the higher value reflects poorly maintained pipelines in Russia during the Soviet collapse, and leakages in Russia are now far less (Lelieveld et al. 2005; Reshetnikov et al. 2000). Kirchgessner et al. (1997) argue against this approach, stating it is “subject to numerous errors including gas theft, variations in
temperature and pressure, billing cycle differences, and meter inaccuracies.” With the exception of theft, however, errors should be randomly distributed and should not bias the leakage estimate high or low. Few recent data on lost and unaccounted gas are publicly available, but statewide data for Texas averaged 2.3% in 2000 and 4.9% in 2007 (Percival 2010). In 2007, the State of Texas passed new legislation to regulate lost and unaccounted for gas; the legislation originally proposed a 5% hard cap which was dropped in the face of industry opposition (Liu 2008; Percival 2010). We take the mean of the 2000 and 2007 Texas data for missing and unaccounted gas (3.6%) as the upper limit of downstream losses (Table 2), assuming that the higher value for 2007 and lower value for 2000 may potentially reflect random variation in billing cycle differences. We believe this is a conservative upper limit, particularly given the industry resistance to a 5% hard cap.

Our conservative estimate of 1.4% to 3.6% leakage of gas during transmission, storage, and distribution is remarkably similar to the 2.5% “best estimate” used by Hayhoe et al. (2002). They considered the possible range as 0.2% and 10%.

5 Contribution of methane emissions to the GHG footprints of shale gas and conventional gas

Summing all estimated losses, we calculate that during the life cycle of an average shale-gas well, 3.6 to 7.9% of the total production of the well is emitted to the atmosphere as methane (Table 2). This is at least 30% more and perhaps more than twice as great as the life-cycle methane emissions we estimate for conventional gas, 1.7% to 6%. Methane is a far more potent GHG than is CO₂, but methane also has a tenfold shorter residence time in the atmosphere, so its effect on global warming attenuates more rapidly (IPCC 2007). Consequently, to compare the global warming potential of methane and CO₂ requires a specific time horizon. We follow Lelieveld et al. (2005) and present analyses for both 20-year and 100-year time horizons. Though the 100-year horizon is commonly used, we agree with Nisbet et al. (2000) that the 20-year horizon is critical, given the need to reduce global warming in coming decades (IPCC 2007). We use recently modeled values for the global warming potential of methane compared to CO₂: 105 and 33 on a mass-to-mass basis for 20 and 100 years, respectively, with an uncertainty of plus or minus 23% (Shindell et al. 2009). These are somewhat higher than those presented in the 4th assessment report of the IPCC (2007), but better account for the interaction of methane with aerosols. Note that carbon-trading markets use a lower global-warming potential yet of only 21 on the 100-year horizon, but this is based on the 2nd IPCC (1995) assessment, which is clearly out of date on this topic. See Electronic Supplemental Materials for the methodology for calculating the effect of methane on GHG in terms of CO₂ equivalents.

Methane dominates the GHG footprint for shale gas on the 20-year time horizon, contributing 1.4- to 3-times more than does direct CO₂ emission (Fig. 1a). At this time scale, the GHG footprint for shale gas is 22% to 43% greater than that for conventional gas. When viewed at a time 100 years after the emissions, methane emissions still contribute significantly to the GHG footprints, but the effect is diminished by the relatively short residence time of methane in the atmosphere. On this time frame, the GHG footprint for shale gas is 14% to 19% greater than that for conventional gas (Fig. 1b).
A. 20-year time horizon

![Bar Chart](Image)

- Methane
- Indirect CO2
- Direct CO2

Low Estimate | High Estimate | Low Estimate | High Estimate | Surface-mined | Deep-Mined
---|---|---|---|---|---
Shale Gas | Conventional Gas | Coal | Diesel Oil

B. 100-year time horizon

![Bar Chart](Image)

- Methane
- Indirect CO2
- Direct CO2

Low Estimate | High Estimate | Low Estimate | High Estimate | Surface-mined | Deep-Mined | Diesel Oil
---|---|---|---|---|---|---
Shale Gas | Conventional Gas | Coal | Diesel Oil

Fig. 1 Comparison of greenhouse gas emissions from shale gas with low and high estimates of fugitive methane emissions, conventional natural gas with low and high estimates of fugitive methane emissions, surface-mined coal, deep-mined coal, and diesel oil. a is for a 20-year time horizon, and b is for a 100-year time horizon. Estimates include direct emissions of CO2 during combustion (blue bars), indirect emissions of CO2 necessary to develop and use the energy source (red bars), and fugitive emissions of methane, converted to equivalent value of CO2 as described in the text (pink bars). Emissions are normalized to the quantity of energy released at the time of combustion. The conversion of methane to CO2 equivalents is based on global warming potentials from Shindell et al. (2009) that include both direct and indirect influences of methane on aerosols. Mean values from Shindell et al. (2009) are used here. Shindell et al. (2009) present an uncertainty in these mean values of plus or minus 23%, which is not included in this figure.

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6 Shale gas versus other fossil fuels

Considering the 20-year horizon, the GHG footprint for shale gas is at least 20% greater than and perhaps more than twice as great as that for coal when expressed per quantity of energy available during combustion (Fig. 1a; see Electronic Supplemental Materials for derivation of the estimates for diesel oil and coal). Over the 100-year frame, the GHG footprint is comparable to that for coal: the low-end shale-gas emissions are 18% lower than deep-mined coal, and the high-end shale-gas emissions are 15% greater than surface-mined coal emissions (Fig. 1b). For the 20-year horizon, the GHG footprint of shale gas is at least 50% greater than for oil, and perhaps 2.5-times greater. At the 100-year time scale, the footprint for shale gas is similar to or 35% greater than for oil.

We know of no other estimates for the GHG footprint of shale gas in the peer-reviewed literature. However, we can compare our estimates for conventional gas with three previous peer-reviewed studies on the GHG emissions of conventional natural gas and coal: Hayhoe et al. (2002), Lelieveld et al. (2005), and Jamarillo et al. (2007). All concluded that GHG emissions for conventional gas are less than for coal, when considering the contribution of methane over 100 years. In contrast, our analysis indicates that conventional gas has little or no advantage over coal even over the 100-year time period (Fig. 1b). Our estimates for conventional-gas methane emissions are in the range of those in Hayhoe et al. (2002) but are higher than those in Lelieveld et al. (2005) and Jamarillo et al. (2007) who used 1996 EPA emission factors now known to be too low (EPA 2010). To evaluate the effect of methane, all three of these studies also used global warming potentials now believed to be too low (Shindell et al. 2009). Still, Hayhoe et al. (2002) concluded that under many of the scenarios evaluated, a switch from coal to conventional natural gas could aggravate global warming on time scales of up to several decades. Even with the lower global warming potential value, Lelieveld et al. (2005) concluded that natural gas has a greater GHG footprint than oil if methane emissions exceeded 3.1% and worse than coal if the emissions exceeded 5.6% on the 20-year time scale. They used a methane global warming potential value for methane from IPCC (1995) that is only 57% of the new value from Shindell et al. (2009), suggesting that in fact methane emissions of only 2% to 3% make the GHG footprint of conventional gas worse than oil and coal. Our estimates for fugitive shale-gas emissions are 3.6 to 7.9%.

Our analysis does not consider the efficiency of final use. If fuels are used to generate electricity, natural gas gains some advantage over coal because of greater efficiencies of generation (see Electronic Supplemental Materials). However, this does not greatly affect our overall conclusion: the GHG footprint of shale gas approaches or exceeds coal even when used to generate electricity (Table in Electronic Supplemental Materials). Further, shale-gas is promoted for other uses, including as a heating and transportation fuel, where there is little evidence that efficiencies are superior to diesel oil.

7 Can methane emissions be reduced?

The EPA estimates that 'green' technologies can reduce gas-industry methane emissions by 40% (GAO 2010). For instance, liquid-unloading emissions can be greatly
reduced with plunger lifts (EPA 2006; GAO 2010); industry reports a 99% venting reduction in the San Juan basin with the use of smart-automated plunger lifts (GAO 2010). Use of flash-tank separators or vapor recovery units can reduce dehydrator emissions by 90% (Fernandez et al. 2005). Note, however, that our lower range of estimates for 3 out of the 5 sources as shown in Table 2 already reflect the use of best technology: 0.3% lower-end estimate for routine venting and leaks at well sites (GAO 2010), 0% lower-end estimate for emissions during liquid unloading, and 0% during processing.

Methane emissions during the flow-back period in theory can be reduced by up to 90% through Reduced Emission Completions technologies, or REC (EPA 2010). However, REC technologies require that pipelines to the well are in place prior to completion, which is not always possible in emerging development areas. In any event, these technologies are currently not in wide use (EPA 2010).

If emissions during transmission, storage, and distribution are at the high end of our estimate (3.6%; Table 2), these could probably be reduced through use of better storage tanks and compressors and through improved monitoring for leaks. Industry has shown little interest in making the investments needed to reduce these emission sources, however (Percival 2010).

Better regulation can help push industry towards reduced emissions. In reconciling a wide range of emissions, the GAO (2010) noted that lower emissions in the Piceance basin in Colorado relative to the Uinta basin in Utah are largely due to a higher use of low-bleed pneumatics in the former due to stricter state regulations.

8 Conclusions and implications

The GHG footprint of shale gas is significantly larger than that from conventional gas, due to methane emissions with flow-back fluids and from drill out of wells during well completion. Routine production and downstream methane emissions are also large, but are the same for conventional and shale gas. Our estimates for these routine and downstream methane emission sources are within the range of those reported by most other peer-reviewed publications inventories (Hayhoe et al. 2002; Lelieveld et al. 2005). Despite this broad agreement, the uncertainty in the magnitude of fugitive emissions is large. Given the importance of methane in global warming, these emissions deserve far greater study than has occurred in the past. We urge both more direct measurements and refined accounting to better quantify lost and unaccounted for gas.

The large GHG footprint of shale gas undercuts the logic of its use as a bridging fuel over coming decades, if the goal is to reduce global warming. We do not intend that our study be used to justify the continued use of either oil or coal, but rather to demonstrate that substituting shale gas for these other fossil fuels may not have the desired effect of mitigating climate warming.

Finally, we note that carbon-trading markets at present under-value the greenhouse warming consequences of methane, by focusing on a 100-year time horizon and by using out-of-date global warming potentials for methane. This should be corrected, and the full GHG footprint of unconventional gas should be used in planning for alternative energy futures that adequately consider global climate change.
Acknowledgements  Preparation of this paper was supported by a grant from the Park Foundation and by an endowment funds of the David R. Atkinson Professorship in Ecology & Environmental Biology at Cornell University. We thank R. Alvarez, C. Arnold, P. Artaxo, A. Chambers, D. Farnham, P. Jamarillo, N. Mahowald, R. Mariano, R. McCoy, J. Northrup, S. Porder, M. Robertson, B. Sell, D. Shrag, L. Spach, and D. Strahan for information, encouragement, advice, and feedback on our analysis and manuscript. We thank M. Hayn for assistance with the figures. Two anonymous reviewers and Michael Oppenheimer provided very useful comments on an earlier version of this paper.

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References


From: Susan Harvie
To: <frac-review@gov.ns.ca>
Date: 2011-05-01 7:44 PM
Subject: comments for Hydraulic Fracturing Study

I am not in-favour of Hydraulic Fracturing. I would rather pay more for gas & related products, than take any chances.

Susan Harvie,
From: "Gale Abbey"
To: <frac-review@gov.ns.ca>
Date: 2011-05-02 12:06 PM
Subject: Hydraulic Fracturing

Dear Sir/Madam,
Please accept my sincere petition expressing my great reluctance in seeing the province of Nova Scotia take any part in hydraulic fracturing.

This process appears to be very detrimental to the environment in so many ways.
1. Water Pollution of local wells
2. Air pollution as the recovered fluids are blown into the environment as they return to the earth's surface.
3. Destruction of the nearby environment with no apparent requirements to leave the area (both above and below the surface of our earth) as it was when they arrived.
4. Refusal of the natural gas industry to take responsibility for pollution and destruction in the areas where they work.
5. BUT MAINLY my concern is that tons and tons of water and dangerous chemicals are put into the earth and at least 1/3 of this mix is never recovered.

While I realize that Natural Gas is a fairly clean energy and that it would be good to use our own resources, please don't let the gas industry destroy our province unless we can be absolutely certain that hydraulic fracturing is the best source of energy for our future and for our overall environment. At present we don't know enough about the ultimate results to carry on with Hydraulic Fracturing - even of test wells.

Gale Colpitts Abbey
From: "Jennifer West" <groundwater@ecologyaction.ca>
To: <frac-review@gov.ns.ca>
Date: 2011-05-02 2:17 PM
Subject: Public comments

I would like some clarity on the public comments: please let me know what information you hope to achieve from the comments. Do you want people to comment on each of the points in the scope? Do you people to comment on how the province should control or regulate each of these points? Should the public make additional comments on points that are not in the scope? Should we make additional points that should be included in the final scope? I would very much appreciate some clarity on these and other points. Please reply or give me a call when you can.

Most Sincerely,

Jennifer J. West, M.Sc., P.Geo.
Groundwater Coordinator
Ecology Action Centre
2705 Fern Lane
Halifax NS, B3K 4L3
T: (902) 442-5046
F: (902) 405-3716

<http://www.ecologyaction.ca/content/become-member>

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Join us on Facebook <http://www.facebook.com/EcologyActionCentre>
Follow us on Twitter <http://twitter.com/ecologyaction>
From: Edwin Macdonald  
To: <frac-review@gov.ns.ca> 
Date: 2011-05-02 3:15 PM  
Subject: Frac Comments

To Whom It May Concern,

I am a professional geologist registered in Nova Scotia and I have been involved with Frac Stimulation Programs in NS and elsewhere. The hysteria which has been circulating about fracturing is largely a function of poor reporting by the media. It seems that anyone who is willing to fight for a cause has joined the bandwagon without understanding the process or regulations. In Nova Scotia, the Oil and Gas industry is already stringently regulated. This reservoir stimulation technique can be done safely and should be allowed, provided that companies adhere to the rules in place.

Let's face it. We have a Dept of Energy who regulate the industry, but, they also solicit at every trade show in the world. We have no onshore production and there are areas which are under explored. If we decide to limit exploration companies as to what procedures they are allowed to perform, (within our own regulations), we will scare them away from doing any work in Nova Scotia. Exploration is a big dollar high risk endeavor. If the regulators start changing the game on the exploration companies, they will loose significant interest in our province.

Sincerely
From: Larry Smith <frac-review@gov.ns.ca>
To: frac-review@gov.ns.ca
Date: 2011-05-02 5:58 PM
Subject: Comments on the dangers of Fracking in N. S.

I am very concerned about the allowing of fracking in Nova Scotia.

From what I have learned, it requires numerous derricks and related infrastructure, uses huge amounts of water and toxic chemicals, and produces large quantities of toxic waste.

The results are:
- unsightly landscape
- pollution of rivers, lakes, groundwater and wells
- damage and destruction to vegetation.

There is no great need for new gas wells. Encana has indicated that there is a surplus of gas, and hence its low price. That company has announced that it will close several wells for this reason.

In the interests of quality of life and the environment, I urge our government not to permit fracking. Let's wait and see, as in a few years it is probable that the price will go up, making the the resource more valuable. Hopefully environmentally friendly extraction methods will be developed by then.

If you have not already seen the documentary called "Gasland", I urge you to watch it.

-Larry Smith
From: larry joice
To: <frac-review@gov.ns.ca>
Date: 2011-05-04 12:27 AM
Subject: water conservation

One of the biggest issues that we are finding here in Northern BC would be that of water conservation. Huge amounts of water is being used in the Fracturing process of which I have been involved in for many years now.

One good suggestion would be to utilize the Lagoon water from City waste treatment plants instead of pumping the Lagoon water into the river or ocean.

I am employed as a , and the benefits of have the environmental groups looking at a positive approach will add to the sustainability of the Energy sector.

If you have any further questions I can be reached at the above Email

thank You

Lawrence Joice
From: Gary Blackwood
To: <frac-review@gov.ns.ca>
Date: 2011-05-05 10:56 AM
Subject: Comments

I've just been looking over the draft fracking review, and there are a couple of issues that aren't addressed in the review. One is the possible link between earthquake activity and fracking, which has shut down fracking efforts in Arkansas (admittedly more earthquake-prone than Nova Scotia).

Of even more concern is the recent study done at Cornell University; the study suggests that the fracking process may actually create "twice" as much greenhouse gas pollution as the use of coal, due to the large amounts of methane released into the atmosphere during the lifetime of the natural gas well. Methane emissions from a shale-gas well may be up to twice as great as those from a conventional well.

I would like to see both of those issues, especially the greenhouse gas problem, addressed in the review. Thank you.

Gary Blackwood
From: Amy Hawke
To: <frac-review@gov.ns.ca>
Date: 2011-05-06 9:46 AM
Subject: Concerned about the effects of fracking - Letter

Dear Team of Senior Technical and Policy Staff,

My family home is situated along the beautiful Northumberland Strait. Every morning we wake up to the sound of the bubbling brook flowing its way to the ocean and at night we listen to the peepers peep from the swamps and ponds through the forest. I do not want to see these beautiful water systems altered and polluted!

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

I’m very concerned about the effects of fracking on:

1. Groundwater
2. Use and effects on surface water
3. Land, such as potential soil contamination
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids
6. Site restoration
7. Financial security / insurance that operators are required to provide prior to conducting
From: Anne Pryde  
To: <frac-review@gov.ns.ca>  
Date: 2011-05-06 9:55 AM  
Subject: Hydraulic Fracturing

Dear Team of Senior Technical and Policy Staff,

My name is Anne Pryde

In Hatchet Lake we are all privy to the quality of ground water as we all use well water for our homes and businesses. The lakes in this area are currently pristine fresh water lakes home to a varied ecosystem of fish, ducks song birds, and wildlife not commonly found sharing land so harmoniously with people. The landscape here is breathtaking and the quality of life for families in this area, I believe, is among the best in the province. One aspect that creates this quality of life is the local lake beaches our children spend most of the summer swimming in and the winter skating on.

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

I am very concerned about the effects on ground water "fracking" in the province can cause. There are thousands of families living on well water with in the province and enjoying our lakes and rivers who can all be effected.

As a person who eats local foods 12 months of the year I am also concerned about the effects on soil. Possible contamination that can easily make it way into our food system damaging an already fragile economy.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Anne Pryde
From: Marla MacLeod
To: <frac-review@gov.ns.ca>
Date: 2011-05-06 9:59 AM
Subject: Concerned about fracking

Dear Team of Senior Technical and Policy Staff,

My name is Marla MacLeod and I am an avid canoeist and camper and I am concerned about fracking in Nova Scotia.

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

I am concerned about the effects of fracking on ground and surface water, as well as the potential soil contamination. Water is a precious resource and large quantities are needed to extract natural gas; this is not an efficient or responsible use of our water resources. Additionally I am concerned about the effects of the chemicals in hydraulic fracturing fluids and the effects they will have on our water and soil.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Marla MacLeod
From: "Ronald Boal"
To: <frac-review@gov.ns.ca>, <mlashelburne@eastlink.ca>, <min_env@gov.ns.ca>...
CC: <premier@gov.ns.ca>, <marilynmoremia@ns.aliantzinc.ca>, <frankmla@ns.sym...
Date: 2011-05-06 11:32 PM
Subject: No fracking in Nova Scotia

Good day.

I am absolutely horrified that anyone in Nova Scotia is seriously considering hydraulic fracturing for natural gas. This is a terrible idea.


Please watch the acclaimed HBO documentary, "GasLand", by Josh Fox, winner of the 2010 Sundance Film Festival Special Jury Prize. This very enlightening and very shocking documentary will show you exactly what has already happened to thousands of Americans who are victims of contamination from this completely negligent method of mining. Please note that one of the energy companies mentioned several times in the documentary is Encana.

Here are some links about the doc, "GasLand":

http://www.gaslandthemovie.com/
http://en.wikipedia.org/wiki/Gasland
http://www.imdb.com/title/tt1558250/

From the IMDB website:

"This film is a much needed warning about the unsafe conditions around hydraulic fracturing. Anyone who doesn't see that clearly is obviously making money on hydraulic fracturing! Can we learn nothing from the current poisoning of the ocean due to unsafe practices in oil drilling? These companies only concern is profit- at all cost. As this film demonstrates and the current events show- poisoning the world around them is an acceptable risk for maximum profit. If not, why would they continue to campaign for the hydraulic fracturing (or Fracking) of the Marcellus Shale? (and the rest of the United States...)

Fracking is especially dangerous for New York City because the city gets its water from the Adirondacks. Currently, fracking is not allowed in the NYC watershed part of the Marcellus Shale which stretches from upstate NY to Tennessee. In addition to the problems with toxic chemicals injected into the ground with fracking, the Marcellus Shale is radioactive so that waste from fracking contains low levels of radioactivity.

I would love to see those reviewers trying to debunk this film drink the water coming from the faucets of so many homes shown in the film. Water that is flammable straight from the sink! Authorities defending fracking as harmless refuse to drink the water offered them in the film and so would those narrow minded negative reviewers. (Or should I say profiteering propagandists... what's your day rate for writing these reviews?)

Wind and sunlight is free and can be harnessed to produce the energy we need to keep the world moving without poisoning our water and air. Let's suck it up and make a change! It will take money and time and mean less profit for some but there is a bigger picture to consider."

Please, if you care at all about the quality of water in Nova Scotia, or about the health and safety of it's citizens, do not allow any company to frack in this province.

Please sign the petition to ban fracking in Nova Scotia:
May 3, 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442
Halifax. NS B3J 2P8

To Whom It May Concern:

My husband and I are recent emigrants to Nova Scotia from Oregon in the western US. We are currently enjoying the status of permanent residency. The attractions of this Province are many and we did not undertake a cross-continent move without serious consideration of the advantages and disadvantages. We were, of course, very taken with the physical beauty of the Province as well as its reputation for strong environmental policies. The amount of recycling that is done is most impressive and should serve as an exemplar for other states and provinces.

Given Nova Scotia’s reputation for being “green,” it was a great and horrible shock to learn that extraction of natural gas via “fracking” is being considered not so very far from our home in Gaspereau. Natural gas is, of course, a cleaner fuel than coal or oil products but the extraction process is anything but clean. The possible risk to the water table and to fish-bearing streams is huge. The necessity of supplying clean water to those homes with polluted wells will be immense. The amount of off-gassing of methane will contribute more to global warming than the CO₂ it generates when burned. Furthermore, the volatile organic cocktail that is used in the fracking process contributes mightily to air pollution with serious health consequences. The health care system will certainly be impacted as new “conditions” affect the citizenry.

Beyond the health concerns for all residents of Nova Scotia, including plants and animals, the destruction of the natural beauty will spell an end to tourism in those areas affected. As my husband and I drove through Wyoming, the home of thousands of fracking wells, our most immediate desire was to exit the state. Its resemblance to Tolkien’s Mordor is not an exaggeration. Given the geographical spread of wells, fracking could easily make the infamous Love Canal in New York State look like a walk in the park.

The immediate benefits of natural gas extraction to Nova Scotians is not very apparent. The province will earn very little in royalties, the citizens will probably not have access to the methane, and the jobs it generates will be hazardous and of short-term duration as the fracking wells dry up. The long-term clean-up costs of abandoned sites will far exceed any short-term monetary gains.

When I left the US, I left a country which has little regard for the impact of short-term gain on long-term prosperity. I can only hope that my new country has better sense.

Sincerely,

Lorna J. Williamson, PhD in Chemistry (Harvard University)
From: Chelsea Boaler  
To: <frac-review@gov.ns.ca>  
Date: 2011-05-06 5:47 PM  
Subject: Fracking Comments

Dear Team of Senior Technical and Policy Staff,

My name is Chelsea Boaler,

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

Water is clearly a necessity for all living things, including people. However, water is not only used as a necessity, it also holds recreational, aesthetic and spiritual value. Fracking holds many issues that include effects on groundwater, surface water and soil. An example can be outlined in Wyoming's well contamination, in which the EPA found the chemicals found in the drinking wells were derived from fracking in the area.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

--
- Chelsea Boaler

恐慌 Before printing, please think about the environment.
Dear sir,

I am against hydraulic fracturing.

1. Lake Minnedosa is the greatest and cleanest freshwater lake in Nova Scotia.
2. Fracturing involves the use of hundreds of chemicals, some are carcinogenic.
3. People around Lake Minnedosa have a pure water table to provide clean drinking water.

We need to go toward renewable energy:

1. Solar. Why are we lagging behind other provinces?
2. Wind mills. Not one here and there but 500 away from homes.
3. Geothermal: All new homes and buildings should use geothermal energy.
4. The Bay of Fundy Tides provide enough energy to supply all of Canada. What are we waiting for?

Congratulations to the N.D. government for not considering nuclear power.

Sincerely Yours
David Boudreau
DAVID BOUDREAU
From: ziaeddn hosseini <
To: <frac-review@gov.ns.ca>
Date: 2011-05-09 4:17 PM

I disagree with anything that threatens our environment as well as Nova Scotia specifically.
Regards
Seyyed Ziaeddn Hosseini
From: jonathan gallant
To: <frac-review@gov.ns.ca>
Date: 2011-05-09 5:59 PM
Subject: Fracking

Dear Team of Senior Technical and Policy Staff,

My name is Jonathan Gallant.

I've enjoyed five summers here, spending a lot of time swimming in our lakes, canoeing our rivers and want our natural environment to remain unsullied by our desire for natural gas.

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

Some concerns I and others have include:

1. Effects on groundwater
2. Use and effects on surface water
3. Impacts on land, such as potential soil contamination
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids
6. Site restoration
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Jonathan Gallant
From: "Jennifer MacLatchy"
To: <frac-review@gov.ns.ca>
Date: 2011-05-09 12:16 PM
Subject: Hydraulic Fracturing Study: Comments

Dear Team of Senior Technical and Policy Staff,

My name is I appreciate the clean lakes that provide HRM tap water, and the convenience of being able to access safe, free, drinking water anywhere in the city. In the summers, I enjoy visiting many nearby lakes, for hiking and swimming. It is this proximity to clean lakes and forests that are safe for swimming and hiking that make Halifax my preferred city of residence.

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

I am concerned about the effects on groundwater and surface water that might result from fracking. I understand that much care is taken to ensure that fluids traveling through a fracking well are contained so as not to contaminate surrounding groundwater and surface water. However, my concern is that the fracking fluid, oil and gas, though at a much lower depth than the groundwater that we use, may eventually mix and disperse through cracks in layers of rock. As well, I am concerned about how collected waste water from this process will be treated and disposed of. Where and how will it be stored, and how will it be transported, treated, and disposed of? How can we ensure that none will leak or spill and contaminate surface water and ground water and soil?

In addition, I am concerned about the amount of water necessary for use as fracking fluid. Where will this water come from, and how will it impact the availability of clean fresh water in Nova Scotia?

Lastly, I am concerned with the impacts on ecosystems. I understand that a substantial amount of space must be cleared to build a fracking site, including tanks for holding wastewater. New roads will need to be built to the drilling site, and all of this results in the destruction of ecosystems.

I am concerned that all of these things will have a detrimental impact on the reasons that I love living in Halifax, and in Nova Scotia. Thank you for the opportunity to voice my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Sincerely,

Jennifer MacLatchy
From: <frac-review@gov.ns.ca>
To: NSE
   Hydraulic Fracturing Study
   Environmental Science and Program Mgt Division
   PO Box 442 Halifax NS, B3J 2P8

Date: 2011-05-11 9:14 AM
Subject: Re Fracking

To: NSE

Dear NSE

I'm writing to express my thoughts on hydraulic fracturing. It should be banned because of the risk to watersheds, well shown in other parts of the world time and again. There are alternatives for clean energy which are better deserving of effort and investment in NS (wind power, tidal power).

I live in southwest NS on a watershed already experiencing severely degraded water quality related to nutrient pollution leading to cyanobacterial blooms.

As a resident of NS and indeed of the world, water quality and preservation is my number one priority - personally and politically.

We could use some serious well informed leadership to protect our water resources.

Sincerely
Debbie Hall
From: Kris MacLellan
To: <frac-review@gov.ns.ca>
Date: 2011-05-11 9:52 AM
Subject: Fracturing

Hello,

My name is Kris MacLellan,

I write to you today to express my discomfort with the potential for expanded unconventional drilling in my home province.

I spent a great deal of time researching drilling during my time at Dalhousie University. I learned that it is true that Hydraulic Fracturing has been employed in parts of North America with few recorded environmental consequences. This fact belies the differences in the hydro-geology between places like Texas, on the Corbett shale, and the North Eastern US and Canada, on the Marcellus shale. The government can not say with 100% certainty that it can protect the drinking water of Nova Scotians through regulation.

Creating a complex industrial system to support horizontal drilling will inevitably lead to trouble, either through groundwater contamination from below, or from mismanagement of excess slickwater ("frack fluids" brought back from underground after the fracture) above ground.

My time on the campaign trail exposed me to a great deal of angst among my fellow citizens over this problem. I implore you to wait until we have further scientific study on the issue, such as we have just received from Duke university yesterday. This new report is the first of many which should give pause to the Government of Nova Scotia in its efforts to jump start a fracking industry in this province.

Thank you for your time,

Kris MacLellan
From: David Blackburn-Kearns
To: <frac-review@gov.ns.ca>
Date: 2011-05-11 10:16 AM
Subject: Fracking Review Request for Comments

After listening to CBC radio this morning on the nation wide topic of
fracking, I would like to add comment. I live in rural Nova Scotia in
I have 2 small children and am concerned about the
quality of life my children will have if the well water they drink is
contaminated by the toxic chemicals used in the fracking process to extract
natural gas. There are known carcinogens in the chemical stew they pump into
the shale. Those chemicals leech into the ground water. The Natural gas
industry expert admitted methane gas also pollutes the well water and that
there is cause for concern. The Duke University study released on May 8th
also confirms extraordinary levels of methane gas and cancer causing
chemicals are a biproduct of the fracking process. I would urge a complete
moratorium for a minimum of 5 years to examine the consequences of allowing
this extraction process and exploration in Nova Scotia. In my estimation
this would ruin the tourism industry that has built up here by Cape George.
Most importantly the health of my family is at stake. If exploration permits
and fracking is allowed to proceed, I will quickly attempt to organize my
neighbours to campaign against the Dexter Government's foolish shortsighted
decision.
Best Regards,
David Kearns
Environmental Concerns and Regulatory Initiatives
Related to Hydraulic Fracturing in Shale Gas
Formations: Potential Implications for North American Gas Supply
A Report Prepared for the Council of Canadians
September 21, 2010

A Report Prepared for the Council of Canadians
September 21, 2010

Lisa Sumi, MSC
Science and Research Advisor, EARTHWORKS

ICF International’s 2010 Natural Gas Market Review identifies natural gas from unconventional shale formations as a “game changer” for North America, providing an increasing amount of the natural gas supply. By 2020, shale gas is predicted to account for over 30% of the natural gas used in North America, up from 13% in 2009.\(^1\) The report specifically mentions that gas from the Marcellus shale plays a critical role in the overall supply outlook.\(^2\)

Initially, gas extracted from the Marcellus shale formation, which spans parts of New York, Ohio, Pennsylvania and West Virginia, is not expected to meet a major portion of Ontario’s natural gas needs. Rather, because of its location, it will be primarily destined for the Northeastern US market. ICF International (hereafter referred to as ICF) reports that Marcellus shale gas has already displaced Canadian natural gas exports in this market.\(^1\)

As mentioned above, by 2020 it is predicted that shale gas will be supplying more than 30% (30 billion cubic feet or bcf per day) of the natural gas in North America, with 20% of that total (6.1 bcf/day) being produced from the Marcellus shale formation.\(^4\) ICF projects that by 2020 “due to the anticipated increases in Marcellus production and anticipated decreases in flows from Western Canada, some Marcellus gas will flow into Canada at Niagara in the summer months, helping to fill gas storage in the Dawn area.”\(^5\)

ICF raises some of the uncertainties with its natural gas supply projections. One of ICF’s key uncertainties is that “If the regulation of hydraulic fracturing becomes more stringent, this could slow the growth of shale gas production.”\(^6\)

The purpose of this paper is to provide some background information on hydraulic fracturing and its potential environmental impacts, and delve deeper into the question of whether or not more stringent fracturing regulations might affect gas development in the Marcellus shale. Additionally, the paper looks at some of the other regulatory initiatives pending in the Marcellus shale region, to see if they, too, might influence the pace or scope of development in the Marcellus shale.

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\(^2\) ICF, 9.
\(^3\) ICF, 26.
\(^4\) ICF, 51.
\(^5\) ICF, 53.
\(^6\) ICF, 75
This paper focuses on gas production in the Marcellus shale because ICF identified the Marcellus as being critical to the North American natural gas supply outlook. Moreover, if Marcellus shale gas supply does decline due to the regulation of hydraulic fracturing or other regulatory initiatives, the gas flowing into Ontario from the western provinces may simply pass through Ontario to meet the needs of the U.S. Northeastern states.7

Section 1 of the report provides a brief description of hydraulic fracturing and some of the environmental impacts related to this technique. Section 2 discusses various regulatory initiatives, including hydraulic fracturing legislation and regulations that have the potential to affect production that may lead to a change in the supply outlook of gas from Marcellus shale.

1. Overview of Hydraulic Fracturing and Potential Environmental Impacts

Hydraulic fracturing is technique used to stimulate the production of oil and natural gas from both conventional and unconventional formations. Typically, the process involves the injection of large volumes of water, sand and small volumes of chemical additives into the target formation. Eventually, the pressure from the fluid injection causes the formation to fracture. The sand remains behind to hold open the fractures and the injected fluids flow back out of the well, thus enabling the oil or gas to flow more freely from the formation into the gas well.

Hydraulic fracturing is necessary to unlock the gas held within dense gas shales. In the late 1990s, natural gas operators developed a technology known as “slickwater fracturing” for use in shale formations. Slickwater fracs were first used successfully on vertical wells in Texas. But it is the combination of horizontally drilled wells and the slickwater fracture treatment that are responsible for the shale gas boom.

The boom has not come without consequences. There are citizens, politicians, public interest groups, landowners and mineral owners from the Barnett Shale to the Marcellus Shale voicing concerns about the impacts of shale development on their health and on their lives.

As mentioned above, the purpose of this report is to round out the picture of the environmental impacts related to hydraulic fracturing. The ICF report lists three major environmental concerns related to hydraulic fracturing mentioned in:

7 As pointed out on p. 9 of the ICF report, “Much of the gas that currently flows on TCPL is destined for the Northeast U.S. Gas production in the Marcellus Shale displaces the need for exports to the Northeast U.S. Therefore, even if the flows on TCPL decrease over time, more of the gas that does flow can stay in Ontario rather than being exported to U.S. markets.” If there is a decline in Marcellus shale gas production, there will be a void in the U.S. Northwest that will need to be filled.
water requirements, chemical exposures, and contaminated water management. These are discussed below.

**Water Requirements**

Wells need substantial amount[s] of water to pump into the deep underground shale formation for hydraulic fracturing. The demand for water competes with other water resource needs.

---ICF, p. 55

In the late 1990s, natural gas operators developed a technology known as “slickwater fracturing” for use in shale formations. Compared to conventional fracturing jobs, these operations use much higher volumes of water. For example, a Marcellus Shale well fracturing operation requires from 1 to 10 million gallons of water compared to the 50,000 gallons reportedly used to fracture conventional natural gas wells in the Western Canadian Sedimentary Basin. It has been reported that shale wells in BC’s Horn River Basin may require as much as 26 million gallons of water to hydraulically fracture a single horizontal well.

The transportation of a million gallons of water to fracture a well is estimated to require 200 truck trips, so a 5-million-gallon hydraulic fracturing operation would require 1,000 truck trips. Not only does this create the potential for local air quality concerns, the level of heavy truck traffic also creates road repair issues and safety concerns if the trucks are driving through residential neighborhoods.

The cost of water haulage increases with the distance between the source-water and the gas well. Consequently, shale gas operators prefer to extract water from

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8 Hazen and Sawyer estimate 3 – 8 million gallons; Vidic estimates 1 – 8 million and Kargbo et al. estimate that 2-10 million gallons are required.


nearby streams or underground water supplies. The most appropriate locations for water withdrawals from the public or regulatory agency perspective may not be in close proximity to the hydraulic fracturing location. In these cases, water transportation may add substantial costs to shale gas operations.

According to Radisav Vidić, professor of civil engineering at the University of Pittsburgh, water transportation costs for Marcellus producers “can be significant.” He cites a range in costs from $0.10 a barrel (42 gallons) to $2 a barrel. Based on Vidić’s number, hauling water for a 5 million gallon hydraulic fracturing operation would cost the operator between $12,000 and $240,000.

Concerns about the ecological impacts to aquatic resources resulting from huge water withdrawals have been raised throughout the Marcellus shale region. Potential impacts include aquifer depletion, stream flow depletion and disruption of natural flow regime, and interference with flows to wetlands and other water dependent ecosystems. In turn, aquatic life, fish, wildlife and plant life can be affected, and drinking water supplies can be depleted.

**Chemical Exposures**

*Hydraulic fracturing fluid is a mixture of water, sand and chemicals that includes friction reducers, biocides, surfactants and scale inhibitors, acids. The principal concern, however, is whether these chemicals could come in contact with groundwater and water supplies.*

- ICF, p. 55.

Data supplied to the New York Department of Environmental Conservation by companies hoping to develop Marcellus shale wells in that state included 200 different chemicals that may be found in fracturing fluids.

Exposure to these chemicals can occur in a variety of ways. Hydraulic fracturing fluids can spill, posing health hazard to workers or others who come into contact with the chemicals. For example, an emergency room nurse in Colorado was exposed to a fracturing fluid called ZetaFlow while treating a gasfield worker whose clothes had been splashed by the chemical. She immediately lost her sense of smell and developed a headache, and within a couple of days her liver, heart and lungs began to shutdown.

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14 Vidić did not explain under what scenarios these costs estimates were derived.

Spills of fracturing fluids and wastes into watercourses can expose aquatic organisms to toxic compounds. For example, in 2009 two spills at a Cabot Oil and Gas well in Pennsylvania entered a stream and resulted in a fish kill.16

There are a growing number of cases in the Marcellus shale of people being exposed to high concentrations of methane, the major component of natural gas, either through leaks from improperly constructed wells, or communication between hydraulic fractures and other geological conduits. In Washington County, Pennsylvania a hydraulic fracture communicated with an abandoned well, which allowed methane to flow to the surface and contaminate private water supplies.17 Methane is not toxic to humans, but it is flammable and can build up to explosive levels. For example, in 2004, about a month after a well was fractured, natural gas was discovered bubbling out of West Divide Creek in Colorado.18 One nearby resident, Steve Thompson, said that, "I came down with a funnel and scooped some of the biggest bubbles with it... I lit the bubbles with a match, and they burned like gas. It even melted my funnel."19

Increasingly in Pennsylvania, companies are constructing large pits or impoundments the size of football fields to hold millions of gallons of hydraulic fracturing fluid wastes, called "flowback." The concentration of such large pools of waste has the potential to create serious air pollution problems due to the release of volatile organic compounds from these wastes.20 Already citizens living close to the flowback recycling ponds have experienced "odors like that of gasoline and kerosene."21

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An air modeling study conducted for New York State looked at the potential emissions from fracturing flowback wastes stored in a centralized impoundment. Based on industry-reported concentrations of methanol in fracturing fluids, the authors were able to calculate that an impoundment receiving 50 million gallons of flowback per year could have an annual emission of 32.5 tons of methanol.\textsuperscript{22} The U.S. Environmental Protection Agency reports that "chronic inhalation or oral exposure to methanol may result in headache, dizziness, giddiness, insomnia, nausea, gastric disturbances, conjunctivitis, visual disturbances (blurred vision), and blindness in humans."\textsuperscript{23}

**Contaminated Water Management**

*Wells produce significant amounts of water along with the gas; this occurs mostly in the early stages of production. The produced water will have the fracking chemicals in it as well as other contaminants from the shale. One of these is a class of materials referred to as [naturally] occurring radioactive materials (NORMs) which collect in the holding tanks. Management of produced water including reprocessing and removal to keep it out of streams and water sources is required by environmental law and regulations.*

- ICF, p. 55

There are two types of fluid wastes that must be managed by natural gas operators. The first hydraulic fracturing fluids flowback. It's been estimated that 50\% of the injected fracturing fluids return to the surface over a period of a few weeks. The volume of flowback can be anywhere from 500,000 to 5 million gallons.\textsuperscript{44}

After the initially large pulse of flowback, the wells continue to generate lower volumes of wastewater or 'produced water' on the order of 100 - 1,200 gallons per day.\textsuperscript{45} These wastes are also known as brine because of their typically high salt content.

Environmental concerns with both flowback and brines stem from the fact that these wastes may contain a variety of chemicals. Recent chemical analyses of flowback from Marcellus wells in Pennsylvania revealed high concentrations (i.e., at levels exceeding water quality standards) of volatile organic compounds


\textsuperscript{44} This is 50\% of the amount of water used to fracture the well.

like benzene and toluene; semi-volatile compounds such as naphthalene; glycols; metals; salts; and radioactive substances such as radium.26

During the fall of 2008, the disposal of large volumes of flowback and produced water at municipal water treatment facilities in Pennsylvania contributed to high levels of total dissolved solids (TDS) in the Monongahela River and its tributaries.27 Subsequent studies showed that in addition to the Monongahela River, many of the other rivers and streams in Pennsylvania had a very limited ability to assimilate additional TDS, sulfate and chlorides, and that the high concentrations of these constituents were harming aquatic communities.28 The PA Department of Environmental Protection quickly took measures to address the high TDS levels, ordering all treatment plants discharging wastewater into the Monongahela or its tributaries to reduce the volume of gas drilling wastewater accepted at their plants to one percent or less of their daily flow.29

2. Regulatory Initiatives May Affect Development of Marcellus Shale

The Marcellus shale lies beneath parts of four states: New York, Pennsylvania, West Virginia and Ohio. Not surprisingly, the different states have had different regulatory responses to the mad dash for shale gas.

According to a study published by the American Petroleum Institute, tax and regulatory policies at local, state, and federal levels have an important bearing on the costs and returns from drilling.30 The following section presents several examples of proposed regulatory initiatives that may influence the pace and scope of gas produced from the Marcellus shale.

26 The Pennsylvania Department of Environmental Protection (PADEP) is undertaking a program to study the chemical composition of flowback water produced from hydraulically fractured Marcellus Shale wells in Pennsylvania. Preliminary results are available through the Palmerton Group. “Frac Flow-Back Water Study.” http://www.palmertongroup.com/services/marcellus-shale-gas.asp Data were reviewed and by Lisa Sumi.
Hydraulic Fracturing Moratorium in New York

Currently, there are no wells being drilled in the New York portion of the Marcellus shale reservoir. And if a bill presently before the New York Assembly passes, there won’t be any Marcellus gas wells in New York for at least another seven months. The Senate version of the bill passed on August 3, 2010. The bill included a measure to ban hydraulic fracturing in deep, horizontal gas wells in the state until May 15, 2011. The moratorium would provide the state’s Department of Environmental Conservation more time to finish its review of the potential impacts of shale gas drilling, and develop new permitting guidelines. The Associated Press reports that the measure is expected to pass the Assembly in the fall.\textsuperscript{11}

In its draft review, the New York DEC stated that prohibition of drilling would contravene Article 23-0301 of the Environmental Conservation Law.\textsuperscript{12} So it is not likely that the department would support a long-term ban on drilling.

But it is possible that state legislators could continue to propose and pass legislation that would put development on hold across the entire state or within specific regions. During the 2010 Assembly there was a bill moving through the Assembly that proposed a moratorium on the issuance of drilling permits in the Catskill region until 120 days after the U.S. EPA completes its study on the potential impacts of hydraulic fracturing on water.\textsuperscript{13}

Even if the statewide moratorium does not last, the New York City watershed is not likely to see any drilling because in April, 2010, NY State DEC announced strict regulations on shale gas drilling in the upstate area that supplies most of the City’s drinking water. The regulations require companies to conduct an environmental impact review for every proposed well in the Catskills and Skaneateles Lake watersheds, making it highly unlikely that any drilling will be done there.\textsuperscript{14}

A study conducted by Tim Considine for the American Petroleum Institute looks at three potential scenarios for gas development in the Marcellus shale states (NY, PA and WV). In the low development scenario there are no wells drilled in New York, in the medium scenario 340 wells are drilled in the state per year, and in the high scenario 502 wells are drilled annually. Under the low scenario, gas production from the Marcellus shale in 2010 is 4 billion cubic feet (bcf) per day, and this rises to 9.5 bcf/day and 13 bcf/day for the medium and high

\textsuperscript{12} Draft SGEIS 9/30/2009, Page 9-2
development scenarios.  

Considine concludes that under the medium and high scenarios the Marcellus region would eventually become the largest natural gas field in North America, which he says could occur if New York lifts its drilling moratorium and Pennsylvania does not impose a severance tax. But if tax and regulatory policies are adopted that increase the costs of production or if natural gas prices remain low for an extended period, then the odds favoring the low development scenario increase substantially.

In the low scenario, Marcellus gas production is 4 bcf/day in 2010, which is 2 bcf/day lower than what is projected for the Marcellus in the ICF Natural Gas Market Report.

If the drilling moratorium in New York is continued, and gas prices remain low, it’s possible that the flow of gas from the Marcellus will not reach the levels anticipated in the ICF report.

**Pennsylvania Severance Tax**

Although not an environmental regulation per se, a severance tax could help local and state officials deal with the cost of some of the impacts related to Marcellus Shale gas development in Pennsylvania. The Governor’s tax plan is similar to the severance tax imposed on the oil and gas industry in West Virginia. The tax levied on gas operators would be 5 percent at the wellhead, plus 4.6 cents per 1,000 cubic feet of gas produced. Such a tax is projected to raise $280 million in 2011.

The Governor Rendell said a severance tax could help to fund road damage, environmental protection, and the training for emergency workers in case of a disaster related to from natural gas drilling.

A report prepared for the American Petroleum Institute suggests that the absence of a severance tax in Pennsylvania and New York helps to offset higher gas development costs in the Marcellus that result from regulations, climate conditions, topography, labor markets, and other structural factors. The authors point out the fact that currently Marcellus drilling is soaring in Pennsylvania and falling in West Virginia, and suggest that while other factors may account for this stark difference, the absence of a severance tax in Pennsylvania may account for a significant share of this difference. They conclude by saying that imposition of

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any significant severance tax on Marcellus gas could induce a redirection of investment flows to other shale plays or other profitable investments.\textsuperscript{38}

These sentiments have been echoed by many others in the gas industry who warn that adopting West Virginia's tax structure could prompt some to send rigs, jobs and money for compressor stations and pipelines to shale formations in other states.\textsuperscript{19}

Consequently, if a severance tax is passed in Pennsylvania this year, or in years to come, there may be a decline in growth of gas production from the Marcellus shale. Similarly, if New York chooses to allow drilling, but imposes a severance tax, gas production in that state might not be as robust as predicted.

**New Pennsylvania Water Discharge Standards**

In August of 2010, Pennsylvania state enacted new rules limiting the discharge of wastewater from gas wells to 500 milligrams per liter of total dissolved solids (TDS) and 250 milligrams per liter for chlorides. All new and expanding facilities that treat Marcellus shale wastewater are required to meet these discharge limits.\textsuperscript{40}

The problem is, there is a severe shortage of treatment facilities that can process flowback and brine to meet these new standards. A facility run by Fountain Quail can meet the new limits, but only has the capacity to treat 200,000 gallons per day,\textsuperscript{41} a second facility can handle 400,000 gallons of flowback per day,\textsuperscript{42} and a third, under construction, is expected to have the capacity to treat one million gallons per day.\textsuperscript{43}

That means there are still more than 7 million gallons/day of flowback and brines that are not being treated.\textsuperscript{44}


\textsuperscript{44} In 2009, wastewater from fracturing flowback and brines produced by the natural gas industry in Pennsylvania was estimated by the industry to be 9 million gallons/day, and this figure was
DEP Secretary John Hanger estimated that treating the water will cost natural gas operators between 12 and 25 cents per gallon,\textsuperscript{45} which amounts to additional costs of between $120,000 and $250,000 to treat a million gallons of flowback.

Disposal wells are not an option available in Pennsylvania,\textsuperscript{46} although some operators are shipping their wastes to Ohio and possibly West Virginia where there are disposal wells. But transporting and disposing of wastes at injection wells is expensive,\textsuperscript{47} and could become even more costly if Ohio passes a proposed bill that would create a $0.20-per-barrel disposal tax on wastes shipped from other states.\textsuperscript{48}

The least expensive method of dealing with flowback is to reuse it to fracture another well. The wastewater is reconditioned with an additive and then blended with fresh water. The flowback water cannot be reused "as is" because the chloride levels create the potential for well casing corrosion, and bacteria in the flowback may also create downhole problems.\textsuperscript{49}

Reusing flowback is not without its problems. There are concerns that even diluted flowback water may adversely impact a well's production capabilities.\textsuperscript{50} Also, reusing flowback cannot be done indefinitely - a time will come when the wastewater is no longer fit to be used, or there may not be another well ready to be fracked. At that point in time, the waste is taken to a facility where the solids are separated out and the water can be reused for hydraulic fracturing.

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\textsuperscript{46} Thompson, D. February 1, 2010. “Scientists search for the best treatment - Industry needs effective way to handle frac water.” Sun Gazette. http://www.sun gazette.com/page/content.detail/id/538767.html?nav=5011

\textsuperscript{47} ALL Consulting report that in Arkansas it can cost upwards of $6/barrel ($0.14/gallon) to transport and dispose of wells in an independently owned disposal well. This works out to be about $140,000 to ship one million gallons. If Pennsylvania operators are shipping out of state, the transport distances may be greater than in the Arkansas example, so costs are likely higher. Source: Arthur, D., Bohm, B., Coughlin, B.J. and Layne, M. 2008, ALL Consulting. Hydraulic Fracturing considerations for Natural Gas Wells of the Fayetteville Shale. p. 18. www.aogc.state.ar.us/ALL%20FayettevilleFrac%20FINAL.pdf


\textsuperscript{50} http://www.sun gazette.com/page/content.detail/id/538767.html?nav=5011
The new wastewater discharge rule has only been in effect for two months, so it’s too early to determine whether the regulation may put a damper on Marcellus gas production in PA. The industry has suggested that it will. The president of a coalition of gas operators in the Marcellus said, “The new TDS limit is unique to Pennsylvania and could put oil and gas producers at a disadvantage, causing an investment shift to other states.”

Regulations Related to Hydraulic Fracturing
The regulatory initiatives concerning the development of the Marcellus shale are not unique, and growing public concern regarding the environmental and public health impacts from hydraulic fracturing is spurring similar initiatives wherever shale gas development is taking place.

Public concern with hydraulic fracturing has been steadily mounting since the early 1990s, when natural gas companies began fracturing in shallow geological formations such as coal beds. The primary concern at that time was over the potential injection or migration of toxic fracturing fluids into water aquifers located near or in the coalbed methane formations.

In 2004, EPA published a study that said hydraulic fracturing posed little or no threat to drinking water supplies in coalbed methane producing areas. While many critiqued the agency’s results, EPA declined any further study of the issue.

Over the past two years there’s been a groundswell in public concern about hydraulic fracturing. The potential environmental impacts from hydraulic fracturing, especially on water resources, have come under intense scrutiny ever since natural gas companies started fracturing the Marcellus Shale formation. This is due in no small part to the fact that the Marcellus underlies watersheds that serve as New York City’s drinking water.

Public concern has also intensified because more information has become available regarding the potential environmental and health effects related to hydraulic fracturing fluids and wastes. For example, for the past five years Dr. Theo Colborn has been collecting a wealth of data regarding chemicals used during hydraulic fracturing of natural gas wells. She has also researched the potential health effects related to exposure of these fracturing chemicals. Her

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most recent summary, includes chemical and health-related data on 201 chemicals used during the hydraulic fracturing process.\textsuperscript{55}

Colborn found that 94\% of the hydraulic fracturing fluid chemicals in her database are associated with skin, eye and respiratory harm, 93\% with harm to the gastrointestinal system, and 83\% with brain and nervous system effects.

Colborn’s research, which also includes analyses of chemicals found in waste pits and chemicals used during the drilling process, was groundbreaking because it was the first time citizens living amidst oil and gas operations had access to a body of scientific data on the potential health effects related to hydraulic fracturing fluids and chemicals used in natural gas development.

Chemical Disclosure
The increased awareness of the potential environmental and health impacts posed by hydraulic fracturing fluids and wastes has led to initiatives at the local, state and federal level to require companies to disclose the chemicals used during hydraulic fracturing.

In 2008, Colorado was the first state in the nation to require companies to disclose the chemicals that it was using in its hydraulic fracturing operations.\textsuperscript{54} The rule requires companies to disclose the chemicals in fracturing fluids to health officials and regulators, but not the public. And disclosure was required only for chemicals stored in 50 gallon drums or larger.\textsuperscript{55}

Two years later, Wyoming passed a much stronger disclosure rule as part of a package of revamped oil and gas rules. The Wyoming disclosure rules went into effect in September, 2010. It requires companies to submit a full list of the chemicals they plan to use during fracturing operations for each individual well. And once the fracturing operation is completed, companies must report the concentrations of each chemical used.\textsuperscript{56}

At the federal level, in two separate initiatives, members of Congress\textsuperscript{57} and EPA\textsuperscript{58} have been pressing companies for more information about chemicals in fracturing fluids.

And in Congress, two bills - the Fracturing Responsibility and Awareness of Chemicals (FRAC) Act by Rep. Dianne DeGette of Colorado, and Clean Energy Jobs and Oil Company Accountability Act would require all oil and gas operators to disclose the chemicals used to fracture its wells. The FRAC Act would also amend the Safe Drinking Water Act to include hydraulic fracturing in its definition of underground injection.

The Independent Petroleum Association of America (IPAA) claims that if hydraulic fracturing is regulated under the Underground Injection Control (UIC) provisions of the Safe Drinking Water Act that there would be an incremental cost of approximately $100,000 per unconventional well.

The American Petroleum Institute puts the regulatory burden placed on shale operators at $47,333, and states state that hydraulic fracturing regulation would also lead to delays in well completion. According to API, experience suggests that a 20% reduction in the number of wells completed each year due to increased regulation is a valid assumption due to the additional time needed to file permits, push-back of drilling schedules due to higher costs, increased chance of litigation, injunction or other delay tactics used by opposing groups and availability of fracturing monitoring services.

Both the IPAA and API estimates of “regulatory burden” are what those organizations have calculated to be the cost to ensure that gas wells that undergo hydraulic fracturing meet the standards required by Class I Underground Injection Control (UIC) wells. This requirement isn’t part of any of the hydraulic fracturing regulations currently under consideration at the federal or state level. Although if the FRAC Act passes, it would open the door for this type of requirement in the future.

It is not possible to know whether or not federal fracturing legislation will go be successful this year or not. But when asked "Is a change in the law coming?" one
Washington, DC analyst who tracks political developments in the energy sector replied, “Probably.”

Exxon, who recently acquired XTO to get into the Marcellus shale gas play is apparently concerned enough about federal hydraulic fracturing legislation that the company included a clause with XTO that allows it to walk away from the deal “if Congress bans hydraulic fracturing or makes it prohibitively expensive.”

If the federal government doesn’t regulate fracturing, other states can still follow Colorado’s and Wyoming’s lead and write their own rules requiring the disclosure of chemicals in hydraulic fracturing fluids.

Conclusions

The Marcellus shale gas play is blessed and cursed by its location. It has the benefit of being located in close proximity to major markets for natural gas. But it also lies beneath some major river basins that provide drinking water to millions of citizens.

The discovery and exploitation of natural gas from shale formations has been dubbed a “game changer” for natural gas supply in North America. Indeed, the size of the resource is extremely large, although as pointed out by ICF in its 2010 Natural Gas Market Review, there are many factors that could affect the amount of gas ultimately extracted from shales.

The extraction of natural gas from shales has not only been a game changer with respect to the North American natural gas supply outlook, it’s raised public awareness with respect to natural gas drilling. This has spurred regulations that may ultimately slow the growth of shale gas development.

There are several regulatory initiatives currently being considered at the state and federal level that have the potential to influence the rate and extent of gas production from the Marcellus shale. The status of at least three of these – federal hydraulic fracturing regulations, the Pennsylvania severance tax and the drilling moratorium in New York State – may be resolved in the next several months, or they may linger for some time, creating uncertainty for the natural gas operators in the Marcellus region.

This report does not offer a detailed economic analysis of the potential compliance costs associated with present regulatory proposals. Rather it

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provides a qualitative overview of the potential for such regulations to significantly slow the production of Marcellus shale gas.

- If the ban on hydraulic fracturing in New York continues, and gas prices remain low, the American Petroleum Institute has calculated that Marcellus shale production might only be 4 billion cubic feet (bcf) per day. ICF’s projected development scenario is that the Marcellus shale will produce 6 bcf/day in 2020. A 2 bcf/day shortfall would most likely mean that Marcellus gas would not be available to meet the winter demand at Dawn.

- The natural gas industry in Pennsylvania is in agreement that a severance tax would drive them out of Pennsylvania. They the West Virginia severance tax as being responsible for that state’s lower drilling figures. It’s unclear, however, how much of an exodus would occur, since so much investment has been made in leasing the Marcellus shale.

- To access the gas in the Marcellus shale, as well as other shale gas reservoirs, hydraulic fracturing is required. The hydraulic fracturing process uses massive quantities of water and creates massive quantities of wastewater. In Pennsylvania, there is not adequate capacity to dispose of or treat hydraulic fracturing flowback and brines. The expense of wastewater disposal or treatment can add significant costs on to the development of a Marcellus gas well. These costs may be too burdensome for some operators.

- If federal regulation of hydraulic fracturing occurs, the ramifications would be felt in every natural gas producing basin in the country. At this point in time, however, the disclosure provisions being proposed federally are not onerous, and should not affect any natural gas producer’s bottom line. If more stringent regulations are proposed at some point in the future, then there may be costs that force some operators out of the Marcellus (or any other) shale gas play.

Given the incipient state of U.S. regulatory controls over shale gas development, the seriousness of the environmental consequences arising from this development, and mounting public concern, projections for dramatic growth in production from shale formations may be significantly overstated.
From: Karen L (ENV) White
To: Baxter, Brent K; Coolican, Murray; Daly, Chris A; Doane, Kim A; Fent...
Date: 2011-05-12 1:21 PM
Subject: Stop Fracking In Nova Scotia -- Comments on the review (web posting)

http://www.stopfrackinginnovascotia.ca/scopereview.html

Stop Fracking In Nova Scotia believes the government’s proposed review does not ask the right questions and takes too narrow a view. We believe that fracking needs a full evaluation in order to protect our environment, our health, our economy, and our rural quality of life.

Send your comments about the fracking review to the government - they say they want to hear from the public. Let them know their proposed review is not good enough.

Here are 6 key points you may want to include in your response.

1. Nova Scotia’s “Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia” as presently defined skips over the essential question, “Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?” The scope of the review should start from this essential question.

2. Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, (http://nslegislature.ca/legc/statutes/envronmt.htm) and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

3. The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

4. Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. (A fuller list of issues is available at http://www.stopfrackinginnovascotia.ca/, click on Take Action)

5. The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to “make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province.”

www.gov.ns.ca/nse/pollutionprevention/docs/Scope_Hydraulic_Fracturing_Review.pdf

6. Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

Add your own ideas about what a REAL review of fracking should consider.

Comments should be submitted by email to frac-review@gov.ns.ca, or by mail to “Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8.

Deadline for comments is June 6.

We encourage you to send copies of your response to your local MLA’s, and to your local newspapers, post it on Facebook, circulate it to your networks - Get the word out and around that fracking is bad news and we need to stop it.
The Government of Nova Scotia has asked for comments on the scope of their "Review of Hydraulic Fracturing for Shale Gas."

Stop Fracking In Nova Scotia believes the government's proposed review does not ask the right questions and takes too narrow a view. We believe that fracking needs a full evaluation in order to protect our environment, our health, our economy, and our rural quality of life.

Send your comments about the fracking review to the government - they say they want to hear from the public. Let them know their proposed review is not good enough.

**Here are 6 key points you may want to include in your response.**

1. Nova Scotia's "Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia" as presently defined skips over the essential question, "Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?" The scope of the review should start from this essential question.

2. Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, (http://nslegislature.ca/legc/statutes/envromnt.htm) and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

3. The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

4. Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. (A fuller list of issues is available at http://www.stopfrackinginnovascotia.ca/. click on Take Action)

5. The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to "make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." www.gov.ns.ca/mrc/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf
6. Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

Add your own ideas about what a REAL review of fracking should consider.

Comments should be submitted by email to frac-review@gov.ns.ca, or by mail to: "Hydraulic Fracturing Study. Environmental Science and Program Management Division, Nova Scotia Environment, P.O. Box 442, Halifax NS, B3J 2P8.

Deadline for comments is June 6.

We encourage you to send copies of your response to your local MLA's, and to your local newspapers, post it on Facebook, circulate it to your networks - get the word out and around that fracking is bad news and we need to stop it.
From: Charlene Morton
To: <frac-review@gov.ns.ca>
Date: 2011-05-12 12:53 PM
Subject: invitation to speak on fracking in NS

Dear Honourable Members,

My husband and I plan to retire in Nova Scotia, and continue to take a strong interest in the province’s political, social, economic, and environmental health. I am writing because I have learned that there is some interest in harvesting shale gas, something that other provinces have been considering. In the process, they have been introduced to research and public comment about the human and non-human dangers directly associated with this new energy source. I am writing to express similar concerns and respectfully request that Nova Scotia’s “Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia” as presently defined should ask nothing less than the question, “Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?”

Most importantly,

Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, (http://nslegislature.ca/legc/statutes/envromnt.htm,)
and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. (A fuller list of issues is available at http://www.stopfrackinginnovascotia.ca/, click on Take Action)

The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to “make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province.”


Finally, any evaluation of fracking should be independent of government and allow for full public participation and access to information.
Thank you for providing this space for the public to join together to express these common concerns about fracking. I hope you continue to find strong political rewards and economic stability for Nova Scotia and its people by continuing to pursue more environmentally sustainable and healthy energy alternatives, such as your growing development of wind projects.

Sincerely,
Charlene Morton
University of British Columbia
From: "Jennifer West" <groundwater@ecologyaction.ca>
To: <frac-review@gov.ns.ca>
Date: 2011-05-12 1:27 PM
Subject: Waiting for response.

I would like clarification on the types of letters you wish to receive for this review. How will the letters be processed? Will they all be posted online? What is the goal of receiving these public comments?

Thank you,

Jennifer J. West, M.Sc., P.Geo.
Groundwater Coordinator
Ecology Action Centre
2705 Fern Lane
Halifax NS, B3K 4L3
T: (902) 442-5046
F: (902) 405-3716

<http://www.ecologyaction.ca/content/become-member>

Become an EAC member <http://www.ecologyaction.ca/content/become-member> | Join us on Facebook <http://www.facebook.com/EcologyActionCentre> | Follow us on Twitter <http://twitter.com/ecologyaction>
From: "Rebecca McKenna"
To: <frac-review@gov.ns.ca>
Date: 2011-05-12 1:49 PM
Subject: Lets have a real review of Hydraulic Fracturing for Shale Gas in Nova Scotia

Re: "Review of Hydraulic Fracturing for Shale Gas."

Fracking needs a full evaluation in order to protect our environment, our health, our economy, and our rural quality of life.

Let's have a real review of the environmental impact of fracking in our region. Such a review ought to be independent of government and allow for public input.

The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to "make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province."

Please make it happen.

Thanks,
Dr. Rebecca McKenna, PhD
From: Chris Milburn
To: <frac-review@gov.ns.ca>
Date: 2011-05-12 2:20 PM
Subject: PLEASE DON'T ALLOW FRACKING

Hi folks

I have a background in physics and engineering, and am now a physician. I've followed the science behind the fracking issue carefully, and have come to the conclusion very strongly that it SHOULD NOT BE ALLOWED HERE IN NS!!

Please don't let this happen here. The evidence is clear. The possible money is not worth the risk.

Sincerely,
Chris Milburn
May 12, 2011

Dear members of the Environmental Science and Program Management Division
Nova Scotia Environment

Re: Hydraulic Fracturing Review Process

I am an economic development consultant. I am concerned that the short-term economic gains that may be offered by fracking will be far outweighed by negative and irreversible environmental, and therefore economic, impacts.

Fracking entails injecting water, sand, and chemicals into rock formations thousands of feet below the surface. Some of these chemicals are known human carcinogens that are toxic in water at even low levels. This is not good. The fluid used in fracking can result in the release of natural toxins stored in rock formations, including radioactive elements like barium and strontium and carcinogens like benzene, which would otherwise remain inert. Also not good. In addition to chemicals, the process requires vast amounts of fresh water. The U.S. Environmental Protection Agency estimates that one well can require as much as 19 million litres of fresh water. Not good! Then there is the issue of waste water disposal after it has been contaminated. None of these things look like tools of economic prosperity to me.

For those that argue that the industry has ways of protecting water and soil from contamination, there are no guarantees against accidents. If we are to learn anything from the oil spill in the Gulf or the nuclear crisis in Japan, it should be that accidents, caused by humans or nature, can and do happen. The economies of these coastal areas have been decimated by these disasters. We are not invincible!

Given these concerns, the review process should be asking, as a fundamental question, whether or not fracking should be allowed in Nova Scotia at all. This is a serious issue, and needs a full-blown arms-length public consultation process to allow all citizens to consider and have input on this question.

As fresh water and clean soil become ever more scarce around the world, we should be taking every precaution to protect our environment here in Nova Scotia. That means saying no to fracking.

Sincerely,
From: marke slipp  
To: <frac-review@gov.ns.ca>  
CC: Ramona Jennex <ramonajennexmla@bellaliant.com>, Jim Morton <jimmorton@ki...  
Date: 2011-05-12 6:05 PM  
Subject: Hydraulic Fracturing In Nova Scotia

~~~~~~~~~~~~~~~~~~To the Team of Senior Technical and Policy Staff from Nova Scotia Environment & Nova Scotia Energy,

After watching a film (GASLAND) on hydraulic fracturing ("fracking") the other night in Wolfville, along with the after-screening Q&A, I was motivated to write to you regarding this issue. I have many concerns about allowing this practice to happen in Nova Scotia. In fact, although I am no expert, from all I understand this should most definitely NOT be allowed to take place here.

The government should not simply "take fracking very seriously"; we need to ban the process of Hydraulic Fracturing completely. For the small benefits that will accrue, it is not worth the deleterious effects that will happen to the environment both around where this practice takes place and further away through its entrance into the water system (ground water & surface water and the coastal water).

There are precious few people that know much about what fracking does, what's involved, and who it affects. I think the Nova Scotia department of Environment is a good entity to inform residents of this province as to the hazards of going forward with fracking. I expect Nova Scotians will receive all the positive information they get from NS Energy, as they do with other energy schemes. Shale gas may be of some economic use, but perhaps it is better to leave this process to a generation down the road that could get a better price for it, and extract it in a more environmentally beneficial manner.

The most serious concerns I have with fracking are that: it involves very large quantities of water; relies heavily on toxic chemicals, involves clearing the land of all trees and vegetation; and leaves many toxins in the ground to interact with drinking water. To top it all off, these impacts are done to mine an energy resource that is not cheap nor clean. And it will likely be sold off to New England rather than be used here in Nova Scotia, just like offshore gas was, while it lasts. And like offshore gas, few jobs were created for Nova Scotians, but much profit for the oil companies resulted. And this was traditional gas ... not this 'squeeze-every-bit-out' approach that happens with fracking.

Nova Scotians living in the Annapolis Valley already have problems with their drinking water. The high levels of toxins in the water from agricultural fertilizers is already troubling. To add to this through the fracking process would be irresponsible for any government to allow. The so-called Windsor Block that is currently under consideration for fracking needs to be shut down immediately. Before any further consideration of fracking taking place in Nova Scotia, a complete list of the chemicals used in the process needs to be listed for the public.

I know you have an extensive review underway, covering everything from effects on ground water & surface water, through impacts on land & soil, to waste management, site restoration and other matters. I do not presume to be an expert on any of this, but I am familiar with the tactics of corporations when they want to exploit yet another resource. They are relentless, reassuring and speak only to the benefits that might happen, and lobbying government to allow them to have their way. I urge you to be sceptical of their claims and wary of their assurances. You state on your web site, "Our rules, regulations and monitoring are all designed to protect us against poor practices [sic]. Any drilling activity in this province must meet stringent environmental and operational requirements or it is not approved." This gives the impression you are ready to approve this process. I disagree with this vehemently.

As you know, water is one of the essentials of life. That there are already questions about the quantity and quality of water in Nova Scotia, both in our rivers, lakes and ground water, as well as the coastal waters of the province, needs to underscore any decision that is made. And every decision needs to be made in the context of our stewardship of the land, of the ecosystems in our care. What will be the effects on our grandchildren's grandchildren? Will we hand over a better place than we were given, or will we have
allowed the exploitation of our resources to the point that they are depleted for our descendents? The First Peoples of this land looked at issues such as this from the point of view of "How will this effect people seven generations from now?" We need to follow this approach in our modern society, NOT the approach of "What can we exploit next?" The latter approach has brought much harm to our environment and our society.

Thank you for the reading about my concerns. I urge you to act responsibly and turn down this proposal when considering the effects of fracking in Nova Scotia. There may be a time in the distant future when the extraction of this gas could happen safely; it is not now.

Sincerely,

marke slipp
From: Jesse McNichol
To: <frac-review@gov.ns.ca>
Date: 2011-05-13 1:04 PM
Subject: Re: Shale Gas Fracking review

Dear members of the legislative assembly,

I am concerned about the potential negative impacts of hydraulic fracturing for liberating shale gas. This type of operation is new, and has many potential negative consequences. A number of potential unknown hazards exist in the geological formations from which gas is extracted that pose a threat both to clean groundwater, as well as the workers extracting the gas. Sour gas (hydrogen sulfide) can potentially be released, as well as methane. Hydrogen sulfide is highly toxic, and methane is an asphyxiation/explosion hazard. A recent study published in the PNAS journal has shown methane contamination of well water within 1km of fracking operations. I am also very concerned that drilling fluids may contain organic compounds that may act as human endocrine disruptors. I support a full review of these impacts with the mandate of a review to decide, based on the precautionary principles outlined in the NS environment act: http://nslegislature.ca/legc/statutes/envromnt.htm. It is my opinion that the great uncertainties surrounding this new industry would require extensive regulation to avoid negative impacts on rural life and public health. I think a moratorium on hydraulic fracturing, as has been instated in NY state in the USA, is warranted at this point in time. The money that would otherwise be invested in regulation and investigation can, in my opinion, be better spent on programs that wean us off of fossil fuels, especially dirty and dangerous sources like shale gas. Yours sincerely,

Jesse McNichol, B.Sc
From: Kristen Morse  
To: <frac-review@gov.ns.ca>  
Date: 2011-05-13 9:33 PM  
Subject: Review of Hydraulic Fracturing in Nova Scotia

To Whom it May Concern,

I strongly oppose the introduction of hydraulic fracturing practices in Nova Scotia. As a community member and business owner in Halifax, I'm deeply concerned that my quality of life could be in jeopardy with the implementation of practices that have been proven unsafe for water, air, and human & animal health.

The current "Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia" must absolutely ask the right questions; like, Is this the safe and smart way to approach energy in our province? What are the implications—direct and indirect, short and long term? In the United States, there have been no proven "safe" ways of fracking. The U.S. is undergoing sever and irreparable damage due to their unrestrained and unregulated fracking practices. This irreversible damage absolutely should not be repeated in Nova Scotia.

Moreover, we have the technology available to provide clean sources of energy to our communities. Solar energy is renewable, does not require that chemicals be injected into our groundwater, does not pollute the air—in addition. Canada has some of the world's best "access" to solar energy—we are positioned incredibly to benefit from a safe, endless supply of energy. Please redirect your funding to support real solutions to growing energy demands.

Thank you for your time.

Kind regards,  
Kristen Morse
May 3rd, 2011

Minister of Energy, Charlie Parker &
Minister of the Environment, Sterling Belliveau
Halifax, Nova Scotia

Re: Hydraulic fracturing in Nova Scotia

I am taking the opportunity provided by your government for public input on this issue.

It would be very welcomed by the citizens of Nova Scotia if your departments would lengthen the time frame for public input OR consider holding multiple public meetings throughout the province on this issue (and perhaps other issues at the same time*). This is far too important an issue to rush through the public consultation process. As public servants to the people of Nova Scotia - like me and my family - can you assure us that you have no reason to hurry through this? Considering that most people are just beginning to learn about the potential effects that gas fracking could have on their communities' water supplies and natural environment, accepting public input until June 6th is simply not a sufficient time frame!

Several other areas in North America have had profoundly disturbing experiences with the gas fracking industry in their communities. Even as long ago as 2008, over 1,000 cases documented by courts and local governments in five states have citizen records that claim the fracking industry contaminated their drinking water.

I can accurately predict that this natural gas extraction industry will not be regulated in a meaningful manner by your government that would assure residents that our water resources would be protected from being degraded or destroyed. Already, one company, PetroWorth, has bypassed established guidelines for consulting First Nations people in the Lake Ainslie Block in Cape Breton who are situated 10 Km from the proposed drilling site. In Rosebud, Alberta, a landowner is suing Encana, the province's energy regulator and the Alberta government $10 million each for polluting her well water. Same old, same old....... When is our Nova Scotia government going to finally put the brakes on destructive industries whose only interest is extracting a resource for personal profit regardless of the negative costs to environment and public health?

All too often taxpayers are assured that industry will be accountable for any "accidental" resource contamination by their governments and end up finding out that both industry and government have managed to remove themselves from any responsibility to remediate and compensate. In the U.S., the industry has managed to be excluded from legislated water protection policies and does not have to reveal to communities the identification of vast arrays of chemicals that are used in the practice. Must we go through the same predictable experiences here?
Gas fracking in the Wolfville – Windsor area is far too close for comfort to our massive underground aquifer from which we all drink.

I do not support hydraulic gas fracturing in our province and request that the practice be banned. If the price of having fossil fuels is going to cost us safe, clean water, then we must get over our addiction to it and we expect our government to lead the way.

* [Some other environmental issues that could be included in a province-wide consultation about natural gas extraction with the public could include: forestry and agricultural biomass production, clear-cutting practices, preferred uses for municipal sewage sludge, protection of our drinking water sources, fair and accurate labeling on consumer goods, and government acquisition of wilderness/farm lands for preservation purposes, etc.]

Sincerely,

[Signature]

Dr. Marilyn Cameron
From: Minister Immigration
To: 
Date: 5/12/2011 12:18 PM
Subject: Concerns about Nova Scotia for Immigrants

Dear

I appreciate you taking the time to email me and express your concerns about how natural gas exploration on Nova Scotia's coast would be perceived by newcomers and potential immigrants. This issue is surely one with many factors to be considered.

I know that the Minister of the Environment and the Minister of Natural Resources are taking into consideration numerous issues when determining whether fracking will be an acceptable practice in the province. I will ensure that your comments regarding the impact on our immigration policy are part of their considerations.

Thank you

Sincerely

Marilyn More
Minister

cc. Minister of Environment
    Minister of Natural Resources
From: "Dhyan Keeble-Morris"
To: <min_immigration@gov.ns.ca>
Date: 4/4/2011 3:35 AM
Subject: Concerns about Nova Scotia for Immigrants

Dear Minister More,

I would like to bring to your attention an issue that currently is cause for concern and one that could effect immigration numbers if nothing is done to stop it. I am referring to the Onshore Shale Gas Exploration and Development currently taking place in Nova Scotia. This involves a technique called Hydraulic Fracturing (Fracking) which uses thousands of gallons of water and toxic chemicals, which can pollute the water and air and destroy the unspoilt beauty of Nova Scotia. There are grave concerns about this process worldwide and just this past weekend work had to stop on a well being drilled in Blackpool UK, because it triggered a 2.2 Earthquake previously unknown in that location.

I have spent a lot of time and energy promoting Nova Scotia to would be immigrants to Canada and other areas around the world and I would like to think that I have helped a number of families make this their future home. I am currently in touch with those that have already received their residency and are about to move here after considerably time and money on their part. How do you think they would feel after being on this long road they have taken, to be informed that the place of their dreams is going to be destroyed? They have researched many other places to live and come to the conclusion that this part of the world would be an ideal place for their children and the best place to put down roots and grow their businesses. Can you help me find the words?

If the news of this procedure continuing to take place in Nova Scotia goes viral then these people would take a serious look at whether to make Nova Scotia their home. Even those that have recently moved here (on hearing about this) have decided not even to wait around to see what is going to happen, but to leave anyway. They came for the unspoilt beauty and if this hangs in the balance, they will leave and others will not come.

This issue is before the Environment Minister at the moment, but it is a concern for all.

Yours sincerely,
Dhyan

Further information can be found here
http://www.stopfrackinginnovascotia.ca
From: <frac-review@gov.ns.ca>
To: 
CC: 
Date: 2011-05-14 3:27 PM

I have written to your office and to the offices' of Karen Casey, Charlie Parker and Brian Skabar several times in regards to my concerns of shale gas exploration in Nova Scotia. As a professional artist and teacher who has shown art work internationally and have been recognized by the White House, I usually take a very private position; I don't feel that I can now. It is my feeling that any evaluation start from the precautionary principal as contained in the Environment Act section 2(b) and should be independent of government or industry and allow for full public participation and access to information. I am disappointed that the Scope Review does not include potential environmental impact (water, soil, forest, wildlife), health impact, economic impact on infrastructure-roads, waste removal, farming, in addition to tourism and property value. At present the review skips over these essential questions nor does it ask "should fracking even be allowed in Nova Scotia or are the risks to great; in my opinion, the Scope Review should start their. I support a ban on fracking in Nova Scotia which would only be lifted if it can be proven that fracking can be done without harm to the environment; the thought that the short term gain of potential jobs (though I don't know how real that is) and royalties by the gas industry seem terribly short sighted next to permanent damage to our water.

Sincerely,
Mark Schwartz
From: <frac-review@gov.ns.ca>
To:  
Date: 2011-05-14 3:44 PM
Subject: hydrolc fracturing

Under no circumstances should hydrolc fracturing be allowed in Nova Scotia. My husband and I have watched documentaries on this subject and we were shocked that it would even be considered in Nova Scotia. New Brunswick has vetoed it. The Maritimes are fairly pristine lands and we do not need this to ruin our provinces. We do not want to leave our children, grandchildren polluted water, dirty landscape and noise caused by the pumps & stations and trucks. It is bad enough that we leaving them with huge financial debts, let us be reasonable on this topic, we do have to draw the line somewhere. Man is the biggest polluter on our planet and we are also the biggest killers of our animal species by reducing their habitats, all for the sake of chasing the big bucks.

First objection: pollution of the water table, by the chemicals used to extract the gas

Second objection: the aquafur is our drinking water

Third objection: methane plus other chemicals eventually will seep into the water table, eg our wells

Fourth objection: noise, no one wants the noisy equipment near our homes.

Micheline Sterling
From: Mark Tipperman
To: <frac-review@gov.ns.ca>
Date: 2011-05-15 1:53 PM
Subject: Fracking
Attachments: Comment Letter Spring 2011.pdf

Attached please find my letter expressing my personal views on your pending study and the assumptions underlying the study.

--
Mark Tipperman*

*A foreign legal consultant in Nova Scotia, a lawyer licensed to practice law in New York, Oregon and Washington State, and not a member of the Nova Scotia Barristers' Society.

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May 15, 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442 Halifax NS
B3J 2P8

Re: Environmental Issues Associated with Hydraulic Fracturing in Shale Gas Operations.

To Whom It May Concern:

I am writing to express my concerns about the review you are conducting to (i) determine how hydraulic fracturing in shale gas operations ("Fracking") are managed in other jurisdictions; and (ii) identify industry best practices. Frankly, you have put the cart before the horse. Before considering how such operations are managed and what the industry may consider to be the best management practices, you need to (i) identify and evaluate all significant adverse environmental consequences associated with Fracking; and (ii) determine whether there are any existing management programs and best management practices which are reasonably certain to obviate all of the significant adverse environmental consequences of Fracking.

Without exception, in those jurisdictions in which Fracking has been permitted: (i) the environmental consequences have been significant and adverse; and (ii) there are no existing governmental regulations or best management practices which have been adequate to avoid the adverse consequences.

I urge you to review the recent in-depth series on Fracking which appeared in the New York Times. http://topics.nytimes.com/top/news/us/series/drilling_do wn/index.html?ref=us. As far as I can determine, the Times investigation into Fracking is the most comprehensive survey to date. According to the Times: over a period of nine months, the Times reviewed more than 30,000 pages of documents from state and federal agencies. https://www.nytimes.com/interactive/2011/02/27/us/natural-gas-documents-1.html#document/6f6d9899. Included in the Time’s website, is the draft EPA report on Fracking, which is a particularly alarming and authoritative overview of the hazards to human health and the environment posed by Fracking.
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I also commend your attention to a study conducted by Cornell University. According to Susan Riha, a Cornell professor who led the university’s study, proper disposal and treatment of the water containing fracking fluids after it is withdrawn from completed wells is a major issue. In addition to fracking fluids, the water can contain high levels of salt and naturally occurring radioactive materials.

Congressmen Waxman and Markey also refer to studies of water contamination linked to fracking in a memo to a U.S. congressional subcommittee:

“In New York, the State Department of Environmental Conservation analyzed wastewater extracted from wells and found levels of radium-226 as high as 267 times the limit safe for discharge into the environment and thousands of times the limit safe for people to drink. Others have raised concerns about water scarcity, since the drilling and hydraulic fracturing of a horizontal shale gas well may require 2 to 4 million gallons of water.” [emphasis supplied]

The Cornell study focuses on the Marcellus Shale, a region stretching from the eastern tip of Tennessee to central New York that contains one of the world’s premier gas deposits—enough to meet 14 years or more of U.S. demand according to experts at Pennsylvania State University. Discoveries in the Marcellus Shale and other shale gas formations led the Potential Gas Committee, a group of industry experts and academicians, to up its assessment of proven and potential U.S. natural gas reserves by 35 percent last year.

Cornell began its study because of industry interest in leasing some of the university’s land holdings. Both Cornell and New York have put moratoriums on drilling pending further study.

In Pennsylvania high concentration of methane gas has been discovered in water from wells within a mile of drilling sites. Some levels are 17 times higher than water further away from gas drilling locations, and one homeowner in Bradford County claims so much methane is coming out of the tap the water can be set on fire. Methane gas can be explosive and has been considered among the most serious risk in gas drilling. [emphasis supplied]

CBS News reported on September 2, 2010 that:

Homeowner Stephanie Hallowich is like many in western Pennsylvania who have watched their once-pristine neighborhood become an industrial site. Sprawling plants with flares that reach high into the night. Noxious smells, trucks, and containment ponds with unknown chemicals are among the complaints of people who live in areas where natural gas companies have descended.

Hallowich believes three natural gas-drilling operations bordering her property turned her well-water black, forcing her to purchase a tank of fresh water every month.
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What's driving the drilling rush here, and across the country, are advances in hydraulic fracturing, or "hydro-fracking," a process whereby millions of gallons of water, sand and chemicals are blasted deep underground — about 5,000 feet — forcing cracks in the shale and freeing natural gas for collection.

It is at the surface where problems have been reported, like blowouts and spills into ground water . . .

... And — as depicted in the HBO documentary "Gasland" — ignition at the kitchen sink.

"Gasland": Is "Fracking" Polluting America?

***

"There's no such thing as zero-impact drilling," says John Hanger, head of Pennsylvania's Department of Environmental Protection. Since 2008 he's doubled the number of state regulators (100 to 205) and inspectors (21 to 45) to oversee the gas industry.

Hanger told Ketylian that there is evidence of chemical contaminants in water. "Spills and surface leaks have, in fact, contaminated people's drinking water," he said.

Yet nationwide the industry is not required to disclose what potentially toxic chemicals — like hydrochloric acid — are used in the drilling process. (emphasis supplied)

A provision of a law proposed by the Bush administration and passed by Congress in 2005 (dubbed by opponents the "Hallerinon loophole") stripped the EPA of its ability to regulate "fracking" — leaving the job of regulatory enforcement in the hands of cash-strapped, undermanned state agencies.

According to an article which appeared in the Montreal Gazette on May 14, 2011:

Scientists at Duke University have found a link between shale gas extraction in Pennsylvania and New York State and contamination of area drinking water with, in some cases, enough methane to make the water flammable. (emphasis supplied)

Co-author Robert Jackson said the study shows that "if you are near a gas well, you are more likely to have problems with your water."
He said that, although it is difficult to draw direct cause and effect, the methane found in sample wells has the same natural gas geochemistry as the methane from local shale gas wells about 2,000 metres below the surface.

Conversely, the tiny amounts of methane found in water from areas with no shale gas drilling did not originate from the geological formations where shale gas is found.

In other words, the water gained this methane naturally as it dripped downward through the soil to the shallow aquifer. This finding increases the possibility that shale gas drilling is contaminating water wells.

The health effects of excessive amounts of methane in drinking water remain unstudied, Jackson said. He said that some landowners he encountered while doing the study "complained of headaches and skin rashes."

The authors recommend forming of a medical panel to study the health effects of methane in areas of shale gas drilling and fracking.

The study is the first to show a scientifically based link between shale gas and groundwater contamination. It raises serious questions about the gas industry's claim that exploration currently under way in Quebec's Utica shales in the Montérégie is environmentally safe and won't harm drinking water.

Environmental concerns recently caused Quebec to tighten its regulations and forbid hydraulic fracturing until an environmental evaluation of the process is completed. Fracturing is allowed for research.

The Duke scientists detected methane in 85 per cent of 60 drinking-water samples and found that the closer they came to shale gas drilling the higher the concentration of methane in well water.

They found that water wells in the vicinity of active drilling operations contained an average of 17 times more methane than samples collected from wells in inactive drilling areas with similar geology.

This concentration of methane is considered "well above the hazard level" set by the U.S. Office of the Interior, the study states.

The authors believe the contamination is caused by high-pressure fracturing that shakes up the shale formations, releasing the gas molecules that cling to the rock, pushing the gas upward. Leaks in the drill casings and fissures formed in the rock allow the gas to migrate upward into shallow water wells.

Fracking fluid is comprised of 99% water and sand, and 1% chemicals deployed to maximize the movement of natural gas from the rock to the surface. This 1% component adds up to hundreds
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of tons of hazardous substances when the aggregate volume is taken into account. These hazardous substances include “friction reducers” to lower resistance as the fluid moves down the well casings, biocides to prevent bacterial growth which may inhibit the flow of gas, and “scale inhibitors” to prevent the build-up of scale within the fracture zones and wellbore. Some of these hazardous substances are known carcinogens. The long-term health and environmental effects of deploying these hazardous substances in Fracking has yet to be determined with certainty but cannot fairly be assumed to be benign.

The Fracking fluid also needs to be disposed of. The fluid is collected on-site after natural gas is extracted, and so contaminated with hazardous substances that the fluid must be treated prior to disposal or return to the environment. Often only a small percentage of the fluid injected into the ground is recovered, with up to 90% left below the surface with no empirical evaluation of the long term effects on human health and the environment. Fracking fluids must be stored on-site, transported from the site, treated to reduce toxicity, and properly disposed of. There are meaningful risks of release in each of these contexts. It is my understanding that there are no facilities in Nova Scotia capable of accepting, treating and disposing of Fracking fluid, nor are there regulations guiding the treatment of this waste.

I am especially troubled to see that Nova Scotia is studying Fracking based on the assumption that Fracking is permissible, and can be conducted in a manner consistent with applicable law. Prince Edward Island and Quebec have already concluded Fracking needs intensive environmental assessment before the practice can be authorized in their provinces.

According to the April 15, 2011 [Prince Edward Island] Guardian:

The increasingly controversial drilling practice of hydraulic fracturing will not get a green light on Prince Edward Island without first undergoing a thorough environmental assessment and public consultation, says the province’s environment minister. [emphasis supplied]

Richard Brown says his department will be extremely cautious if and when it issues any permit to allow companies to drill in P.E.I. by so-called fracking, which involves injecting large quantities of water along with secret mixes of chemicals deep underground in order to break up gas-containing rock formations.

“If there’s problems with fracking, if it has any potential to hurt our groundwater or to hurt the environment or hurt the fisheries in any ways, we’re not going to allow it to happen,” Brown told a group of reporters outside the legislature Thursday. [emphasis supplied]

Our entire area is uncertain by shale, and the area residents’ source of water is private underground wells. Contamination of the aquifer serving our area, would render the area unsafe for human habitation.
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I am equally appalled at the royalty terms on which Nova Scotia will authorize Fracking. A paltry 10% royalty paid on that portion of the gas extracted after almost all production has ceased. This is absurd.

In conclusion, I urge you to place an immediate moratorium on Fracking. The consequences of Fracking to human health and the environment are too serious to consider the possibility of Fracking prior to an exhaustive environmental assessment.

Very truly yours,

Mark Tipperman
From: <frac-review@gov.ns.ca>
To: 2011-05-15 5:16 PM
Date: D-Day Deadline
Subject: To Whom It May Concern:

By June 6 our provincial government wants to hear from citizens concerning the proposed review of fracking in Nova Scotia.

I am such a person and I have two words: don't frack. The precautionary principle of the provincial Environment Act, Section 2 (b) ii is relevant here: if a process is controversial, refrain from proceeding.

Globally, impacts and risks of fracking are becoming increasingly controversial: in France, for example, the process has been called "desecration", endangering both humans and their general environment.

Of the many problems associated with this technology, the one that looms largest in many minds is that of the use and misuse of water. Where, oh where, will the massive amounts of water required for fracking be obtained?

Please: show some leadership and integrity and do not allow fracking here in Nova Scotia -- its natives AND tourists will thank you.

Janet Baker
I am writing in reference to the proposed review of hydraulic fracturing. I think that the scope of the proposed review is too narrow. There are so many factors to be taken into consideration and the more research I have done, the more problems have come to light. There are bans or moratoriums on this process going into effect throughout the world. The public needs to be educated to the facts surrounding “fracking” and the public needs to be part of the decision as to whether it is permitted in our province. Hydraulic fracturing has the potential to cause long term, serious, irreversible harm to people, our natural resources and our environment and we don't want decisions regarding it to be left to a few politicians.

I am also curious as to who would be using this “precious resource” if hydraulic fracturing is allowed? Would it be exported to the U.S. or would it stay here where we have no infrastructure for it? For the people of this province to use it, it would have to be piped into communities, which would not be cost efficient. So, once again we would be supplying the U.S. with raw materials and leaving the mess here.

Thank you,

James Faulise
From: BARBARA DELICATO
To: <frac-review@gov.ns.ca>
Date: 2011-05-16 10:15 AM
Subject: Review of hydraulic fracturing in shale gas operations in NovaScotia

I am writing regarding the proposed review of hydraulic fracturing in shale gas operations in Nova Scotia. I have read the scope of your proposed review and feel that it is too narrow. I wonder what is meant by the industry and regulatory "best practice" -this doesn't necessarily mean it is safe. If this practice is allowed in our province, it has the potential to harm many lives. I have been reading everything I can find about "fracking" and every day more problems come to light. Bans and moratoriums on the practice are being put in place all over the world. The U.S. House of Representatives Committee of Energy and Commerce released a report in April titled "Chemicals in Hydraulic Fracturing". This report lists some of the many toxic chemicals used in fracking. In 4 years, the 14 companies surveyed for the report used 780 million gallons of hydraulic fracturing products, not including water. Some of the companies buy their fracturing products from chemical companies and say they don't even know what chemicals they are using-are they lying or just incompetent?

One other point I would like to make is that hydraulic fracturing is neither "clean" nor is it "green". A tremendous amount of energy is consumed in extraction, processing, compression and transportation of natural gas. Also, a large volume of greenhouse gas is released into the atmosphere.

How effective are our government policies and programs at protecting people, air, land and water from side effects of gas production? I think all the citizens of this province need to have a voice in the decisions regarding this process, which has the potential to cause such devastating long term irreversible harm.

Barbara Delicato
From: Donald Allan  
To: <frac-review@gov.ns.ca>  
Date: 2011-05-16 12:20 PM  
Subject: Hydraulic Fracturing - Draft Mandate

Your mandate and your statement of "facts" seem biased in favour of approving hydraulic fracturing right from the get-go.

You say oil and gas are critical to our daily lives, unlike "intermittent... tidal energy resources". Since when were tides intermittent? I have read articles in the paper of farmers in Saskatchewan complaining about their water subsequent to fracturing operations in the area, and yet you state that no incidents have been reported in the western provinces. How honest are your sources of data?

To be given the standard PR tour at existing operations and be told how wonderful everything is then requires that you also consult with the province of Quebec and other jurisdictions and organizations that are against fracturing or not yet willing to approve it.

You are right, we will never have the scale of operations that Alberta has. But that province is raping their land and is also much larger than we are. A lot of bad things have been done in order to "provide good jobs" but the Dept of the Environment must protect the land and not be influenced by the lure of an "important source of revenue".

You state the rules of Nova Scotia protect against poor drilling practices. However inspectors cannot be everywhere to ensure that they are followed. As was obvious in the recent oil spill in the Gulf of Mexico, short cuts can be taken because the primary focus of big businesses is to make big profits, not to protect the land. No mention is made of how funds could be recovered or bonds posted should the environment be damaged.

These are just a few quick coments based on what is published on your web site. All in all, I have concerns that business interests and tax revenues are already taking the front seat. The NDP was elected to ensure any development of our natural resources is not done for short term gain but preserves the environment for future generations.

Looking forward to your updates and progress on this important issue,

Donald Allan
From: Stephen Guptill  
To: <frac-review@gov.ns.ca>  
Date: 2011-05-16 6:18 PM  
Subject: No Fracking!!!

That our alleged leaders are even CONSIDERING hydro fracking; is sickening. This shows a gross lack of intelligence within our Government.

Exploding tap water, toxic water tables and incredibly sick people are all within a quick Google search, nothing positive has been published in regards to this process, except materials published by the Natural Gas Industry itself, and notably, a leading in Earth Destruction For Profit, Halliburton.

The decision to go through with such a preposterous idea, coupled with the allegedly green plan to clear cut our forest, turn it into coal and then burn it, would indicate an obvious attempt to destroy nature, and possibly humanity and all life forms connected to it.

Why would our Government do this on purpose? Take a good look at what you are doing.

If our leaders are actually this uninformed of what is behind this process, I suggest you look at an independent documentary recently released:
http://www.gaslandthemovie.com/

Regards, and good day to you; Stephen Levi Guptill
From: <frac-review@gov.ns.ca>
To: 
Date: 2011-05-16 7:57 PM
Subject: Fracking

To whom it may concern:

I am gravely concerned about the possibility of hydraulic fracturing for natural gas coming to this province.

If you have not already done so, see this film about the practice:

http://topdocumentaryfilms.com/gasland/

This convinced me that we risk grave consequences that may not be reversible should we adopt these methods.

Yours,

Leo McKay
From: jason whidden
To: <frac-review@gov.ns.ca>
Date: 2011-05-16 8.21 PM
Subject: Hydraulic Fracturing

Considerable controversy surrounds the current implementation of hydraulic fracturing technology in the United States. Environmental safety and health concerns have emerged and are being debated at the state and national levels. A potential hazard that is commonly overlooked is the venting of bulk sand silos directly to atmosphere. When they are being filled, or emptied during the fracture, a fine cloud of silica particulate will be vented directly into atmosphere. This dust has the potential to travel many kilometers on the wind directly into populated areas. While the immediate personnel are wearing personal protective equipment, other people in the area of a well fracture can potentially be exposed. A well blowout in Clearfield County, Pennsylvania on June 3, 2010, sent more than 35,000 gallons of hydraulic fracturing fluids into the air and onto the surrounding landscape in a forested area. Campers were evacuated and the company EOG Resources and the well completion company C.C. Forbes have been ordered to cease all operations in the state of Pennsylvania pending investigation. The Pennsylvania Department of Environmental Protection has called this a "serious incident".

-Jason Whidden
From: "Jennifer McNish"
To: <frac-review@gov.ns.ca>
Date: 2011-05-16 8:34 PM
Subject: Stop destroying the environment for money

The oil companies don't care about keeping the planet for future generations. Their only goal is big profits at the cost of the public's health and the land's beauty.

There is lots of documentation of how the politicians/decision makers are swayed by the oil companies biased research and skewed studies. Please watch the documentary FEUL. It is available at Video Difference. It is an amazing documentary that took 11 years to make and it is eye opening to the corruption and greed of the oil and gas industry. It also shows how possible and beautiful it is to have a sustainable planet.

We need a new direction away from fossil fuels. There are so many possibilities available for providing energy, not just wind, tidal, and solar but algae for instance. Who knows what else will be invented. We have to stop our dependance on fossil fuels, listen to David Suzuki, he has science backing his warnings. Look at the disasters of the oil spills, pipeline leaks, tar sands, the list of destruction will continue without end if we don't demand the clean energy. Money means nothing if you lose everything from a hurricane (caused by global warming) and you have no safe water to drink or irrigate your fields. Ask a cancer patient which means more, their health or a billion dollars.

In Pennsylvania they frac and now the people must drink bottled water provided by the oil company. But the oil company denies causing the contamination of the water. The people are sick and suffering but the corporations deny culpability.

Please don't let them come here, we don't need the money, we need safe water to drink. I know I live in the city so chances are good my tap water will be remain drinkable but I am a Nova Scotian and the other rural Nova Scotians deserve the same. Please don't let them exploit us, ruin the beautiful landscape (I like to hike) and destroy the peaceful quiet countryside. It is not worth any amount of money. Tell them Nova Scotia isn't for sale, I hope New Brunswick does the same.

Respectfully,

Jennifer McNish
I was born here moved all over Canada and came back 30 years ago, I love it here!
From: Tracey Hatcher
To: <frac-review@gov.ns.ca>
CC: <meganleslie@ndp.ca>, <premier@gov.ns.ca>, <min_env@gov.ns.ca>, <info@an...
Date: 2011-05-16 8:44 PM
Subject: NO NO NO TO FRACKING ANYWHERE IN NOVA SCOTIA!!!

As a native Nova Scotian and a tax payer in both the HRM and Kings County, I would like to register my opposition to fracking in Nova Scotia. Please do not let this happen to our beautiful province.

Thank you.

Tracey Hatcher
May 11, 2011

Honourable Sterling Belliveau
Minister of Environment
P.O. Box 442
Halifax, N.S.
B3J 2P8

Dear Minister Belliveau,

Please find enclosed a copy of my recent letter to Premier Dexter.

The potential for negative impacts from hydraulic fracking seems to completely overweigh any potential benefits to the citizens of Nova Scotia. I respectfully urge you to consider a long term moratorium on any shale gas exploration and exploitation within the Province. There is nothing to be gained by jumping on this passing “band wagon”.

Sincerely,

Ken J. Harrison
May 9, 2011

Premier Darrell Dexter
Office of the Premier
P.O. Box 726
Halifax, Nova Scotia
B3J 2T3

Dear Premier Dexter,

I am writing to express my concern about the steps that Nova Scotia is taking to allow exploration and test drilling for shale gas within this Province. Given the problems revealed in other jurisdictions, it seems naive and foolhardy to proceed with any of this exploration and testing without a thorough review and a complete set of regulations which address the potential negative impacts to our water and air. As seen with the Westray mine disaster nineteen years ago, even the presence of Provincial or Federal regulations for underground mining were no guarantee of ultimate safety. Regulations without enforcement are meaningless.

Hydraulic fracturing is, by its very nature, an unpredictable process and our provincial geology is sufficiently complex that we should expect the unexpected. Fractures will occur in strata where we will be assured in advance that: “it can never happen!” As a starting point, the province should demand that any company that proposes exploratory drilling or hydraulic fracturing MUST establish the baseline of water quality for any and all water wells or municipal water supplies on the aquifers where they propose to conduct operations. These baselines must be established for any and all components of the materials used in the fracturing process. This will ensure that if there is a subsequent problem with water quantity or quality it won’t be left to the individual landowners to seek legal redress from companies who demand proof that they caused the problem. Any liability must remain with the exploratory and production companies.

The exploration and production companies estimate that the average well might produce an ever-diminishing supply of gas for a period of about seven years. Any gas would only be exported to the northeastern USA, so any industrial spinoffs or job creation would be minimal. We would be left with any environmental impacts since once groundwater is contaminated, no clean up is practical or even possible. Is this a desirable outcome or a great legacy?
In Nova Scotia, we could be left with the bill to supply water to individuals and communities where hydraulic fracturing techniques were used and the unintended consequences could include contaminated groundwater aquifers. If the effort to create responsible regulation and enforcement of all aspects of the shale gas exploitation process is beyond the capacity of the Province of Nova Scotia, then I respectfully urge you to abandon any and all plans to allow shale gas exploration or exploitation within the Province of Nova Scotia.

If those companies feel that any serious regulation is excessive and too costly, then perhaps that is the best single indicator that they don’t have our interests at heart. We don’t need to have Nova Scotia citizens used as a case study for the perils of shale gas extraction.

Yours truly,

Ken J. Harrison

Cc: Hon. Charlie Parker, NS Minister of Energy
Hon. Sterling Belliveau, NS Minister of Environment
From: <frac-review@gov.ns.ca>
Date: 2011-05-17 9:49 AM
Subject: review

To our Government
This letter is to be included in I'm sure the many that have been submitted for your "Review of fracking"
The links are to numerous to add... You have been given the information from many sources. I have been Emailing to the Gov of Nova Scotia and the Dept of Energy all the facts and figures regarding "fracking" and regarding oil and gas exploration less than 800 meters from Nova Scotia's largest fresh water lake. I have been doing this since November 2010... We have provided Scientific reports from Reputable people, last one I believe was from Mr David Suzuki. We have given examples of water contamination and the destruction of towns and communities by adventurous oil and gas companies. To you it may be royalties, but to us it is our way of life, its our environment and its our future. That future is not looking bright with even the treat of Oil and Gas production. Many of us have had to put our lives on hold as we sit back and wait for this Government to recognize and take action in a stand on banning Fracking in Nova Scotia. So please get your heads up where we can see them and do the only justifiable thing, grab the initiate be a leader in the Global Environmental fight, and put an immediate ban on this method of Gas and Oil production.

Regards
Rebecca Parkins
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 2011-05-17 12:32 PM
Subject: ordinary gal.

Dear Sirs,

I believe we have all the information we need to know that fracking is not the way to go in our province. We have the largest fresh water lake in Nova Scotia and we are about to destroy it. Do we really NEED this gas now, can we not wait until there is absolutely no chance of harming this lake. I am a gaspereau fisher person on the Margaree River, witch is a Heritage river I might add. Every morning I sit in awe of the animals that live along the river. The smell's, the sounds of nature is amazing. It's one's own little paradise here on earth. Have any of you ever been here? If not, this is also an invitation to come and see what's at stake. I believe here in Cape Breton we're a simple people, we just need family, friends, a full belly and a roof over our heads to be happy. If there is money to be made on this you can be sure it's not for the ordinary guy living here. PLEASE, from myself and family put a ban on this fracking and invest money in more friendly means.

Mary C Gillis
From: "Graham Hutchinson,
To: <frac-review@gov.ns.ca>
Date: 2011-05-17 11:52 PM
Subject: Scope Review Submission

To The Nova Scotia Scope Review

From:

The Scope of the Review is inadequate as it makes the arrogant and unproven assumption that hydraulic fracturing for deep shale gas is a well understood process that can be regulated and controlled. This assumption may not be entirely the fault of Government, as the Industry continues to pedal half-truths and inaccuracies.

Inaccuracies and half-truths

1. i) "Fracking has been going on since 1947 with hundreds of thousands of wells drilled so it must be ok - it has stood the test of time." NO - horizontal drilling and hydraulic fracturing of deep shale is a new development and is untested by time. In the Annual Review of Energy 1998, Jack Hollander writes "Recently a DOE field test in West Virginia (43) suggested that horizontal drilling may be a breakthrough for shale gas, or at least for opening up considerably more of the resource for economic exploitation". Therefore even in 1988 the procedure was still an in a research stage. It is only in the last decade that the process has been fully implemented to extract shale gas.

ii) "We only use a very small proportion of chemical in the procedure - only 1%." NO, "Proportion" is the key word as when 10,000,000 gallons of water are used, such as in a 10 frac well, the insignificant 1% amount of chemical turns out to be 100,000 gallons.

iii) "We've come clean - we've published the chemicals we use on a website." NO, the website uses the phrase "commonly used" and the list is incomplete. In the recent Report to Congress, Industry agreed that it did not know the content of the third party chemical mixes it purchased for its operations. Therefore the degree of toxicity and hazard of these chemicals is unknown.

iv) "We've drilled hundreds of thousands of wells and there has been no evidence of contamination of drinking water." This has just been disproven by a study from Duke University that found increased levels of deep shale methane in water wells nearer fracking operations. Most wells are drilled in unpopulated areas therefore any figures used are skewed. It is like saying "Icebergs do not sink ships"

v) "Fracking does not cause earthquakes". As far back as 1983 as noted in Hydraulic Fracturing and Geothermal Energy: Proceedings of the First Japan and United States Joint Seminar "10km east of the hydraulic fracturing experimental site very shallow earthquakes of one to two kilometres of focal depth have been observed"
vi) "With Regulation the process can be safely controlled" NO, in the Marcellus Shale there have been over 1600 recorded deliberate violations by the DEP. There have been accidents, truck crashes and human error that has caused fires and contamination spills.

Irrespective of the mis-information Industry continues to pump out there are many aspects of the fracking process that deserve wider examination beyond the Scope Review.

Radon and Uranium

The soils of the Northern Shore is late carboniferous and has been shown to contain some of the highest levels of radon in the Province with levels as high as 60 KBq/m3. There is potential for uranium (from which radon is derived) to enter the groundwater by fracking. The North Shore area is defined as a Level 1 area - one most likely to have Uranium in groundwater exceeding acceptable levels. University of Buffalo researchers have shown that fracking also releases trapped uranium finding it chemically and physically attached to hydrocarbons. Further they found that the uranium became soluble and could potentially make recovered frac fluid radioactive. The New York Times found a confidential industry document stating that radioactivity from frac fluid cannot be fully diluted in rivers and watercourses. The recent report from Duke University shows that methane from shale is contaminating drinking water wells therefore any other gas present in the shale, such as Radon gas, will also be in the drinking water.

Immigration

Since 2005 around 2000 families have emigrated to Nova Scotia. Amongst UK applicants to Canada it remains a favourite place to live. Candidates tend to be well educated professionals and business people and their families. The immigration process is slow and can take 5 years for Skilled Workers which means that there could be 2000 families waiting to receive their Residency. Should fracking be allowed it is highly likely that they will seek to live elsewhere because one of the main motivations is to escape from UK pollution to a pristine, unspoilt location with fresh air and water. In the London area it is calculated that chlorinated tap drinking water has already passed through seven other humans. Amongst prospective immigrants known to me is a Cordon Blue Chef and a Crown Prosecutor for Her Majesty's Government. Increased numbers of businesses and home enterprises are being created in Nova Scotia from immigration and the return of western Canadians seeing opportunities in the Maritimes where property and living costs are less.

Tourism

Excepting Halifax Region, the North Shore of Nova Scotia has the highest occupancy rates in the Province, 12% higher than the South Shore and 10% higher than Cape Breton, one of the world's top destinations. There is no doubt that noise, heavy truck traffic, busy roads, construction, pipes and unsightly well heads, will deter visitors to the area.

Real Estate Values

Real Estate values are very sensitive to media reports. 2011 has already seen a 5% drop in average price over 2010 and a loss of immigrants and tourists would reduce the Buyer pool, already weakened by fuel prices. The average time to sell a home is currently two years. If a home is near a fracking operation it is unlikely it would sell at all unless the price was reduced to 'give-away'.

Noise, Vibration and Light Pollution

In a noise study in Fort Worth the average background decibels 24 hours a day was 53 close to that of human conversation. During fracturing the decibel averages 10 decibels higher. This does not include
noise of construction and trucking. This assumes an electric rig. With a diesel rig noise is much greater where air compressors are used 24 hours a day for around three weeks.

There is considerable ground vibration when drilling takes place. One of the North Shore's most successful oyster aquaculturalists, who exports worldwide, has warned that shellfish will not spawn if there is any vibration. He also added that migratory sea bass will never return to spawning grounds if there is ground vibration.

For safety reasons active rigs are lit 24h a day and there is considerable light pollution.

Trucking

New York State Department of Conservation estimates that for one well there would be 895 to 1350 truckloads required using up to trucks to the size of 80,000lb 18 wheelers. This would bring noise, traffic, and pollution, damaging roads and increasing chances of traffic accidents.

Jobs

Elmworth Business Plan estimates 15 jobs per 300 wells, with 100 jobs for pad construction. Hardly significant.

Selling Nova Scotia to China

In February 2011 Encana in BC sold 50% of one of its shale operations to PetroChina effectively giving China the Rights to explore 1 million acres of Canadian land.

The Three Pillars of Gas Exploration

The whole issue of fracking centres around the Three Pillars of Fracking. These are

1) That gas extraction is economic
2) That gas will reduce the carbon footprint
3) That gas will provide fuel for the foreseeable future

These have been questioned by J. David Hughes, team leader for unconventional gas on the Canadian Gas Potential Committee, board member of Association for the Study of Peak Oil and Gas-Canada and is a Fellow of the Post Carbon Institute. http://www.postcarbon.org/reports/PCI-report-nat-gas-future.pdf

World-wide

France has banned hydro-fracking. Parts of Germany have banned fracking. Quebec has a moratorium on fracking. South Africa has a moratorium on fracking. Wales UK has prevented fracking. Queensland, Australia has banned the BTEX group of carcinogens used in Fracking. Groups all over the USA and around the world are questioning the technique and its potential harm.

Conclusion

To simply examine the Regulation of hydraulic fracturing is entirely inadequate. It avoids essential basic questions that need detailed examination before the Province is taken in a direction it will be hard to turn back from.
An opportunity for Nova Scotia to grow

One of the reasons Nova Scotia is so attractive to the outside world is the pristine nature of its water, air, land and sea - virtually unspoilt considering its accessibility compared to almost any other place in the western World. The greatest natural resource is its water. Fast disappearing, and with surface water irradiated, water could become a valuable asset to the Province for the long term, compared to the short/mid-term hydrocarbon resource.

There is in Nova Scotia a company that builds solar concentrators with customers in Kenya and Australia - 4 homes can be heated from one unit, $5000/home around the same price as a furnace.

Already the Province attracts organic growers, natural producers, people who believe that working with nature rather than against it results in a better product. Farmers markets, sustainable communities, off-grid, solar, wind, tide - these are all commonly heard words here.

Suppose, instead of embracing natural gas exploration, the Government of this Province stood up against it, announcing Nova Scotia as a world centre for progressive alternative energy strategies and sustainability?

Lastly, stepping back from the discussion I ask whether it is justifiable to contaminate so many millions of gallons of water when the United Nations warns of a deepening world water crisis? In my opinion it is immoral.

Yours sincerely

Graham Hutchinson
Dear Sir/Madam: I am writing in regards to the review of hydraulic fracturing being conducted by the Nova Scotia Government. For 35 years, I was an ecological research scientist with Fisheries and Oceans Canada; I was the Chair of the Halifax Watershed Advisory Board for 13 years; and have been a member of the Shubenacadie Watershed Environmental Protection Society since its inception, a period of over 15 years. During that time I have observed, and participated in many environmental assessments related to marine, freshwater and land-based projects in Nova Scotia. I have observed a number of troubling aspects with many assessments which I would like to ensure are properly handled during this review. They are: environmental impact assessments which are biased towards the proponent's position because they are prepared by consultants hired by the proponent; permits being issued before the assessment reviews are completed; government deciding to issue permits when critical evaluation data are not available and yielding to the proponents' interest of haste, with the caveat that concurrent studies be conducted to collect such information (but negative results will then be too late to halt the project); ongoing environmental sampling requirements being established by the permit issuing body, but without ensuring resources exist to monitor adherence to the sampling protocols and review data collected; and lack of inclusion of effective public input on the environmental impact assessment specifications and review of the assessment document.

Depending on the site specific characteristics, fracking may, or may not, pose significant environmental risk, but in some areas it has the potential to significantly damage water of associated aquifers: by polluting them with the hydraulic inputs from the fracking process, or by releasing trapped gas and petroleum products/byproducts held in the shale deposits; by lowering the water table; or by eliminating local aquifers entirely; and thus negatively impacting any receiving watersheds. All of these impacts could severely impact on the quality of life of citizens, and wildlife, residing in the area affected. I would ask that the review properly evaluate the risk associated with the potential impacts cited above and that the issues that I listed above of poor environmental impact assessment processes will be properly addressed in the review process.

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Wayne
From: <frac-review@gov.ns.ca>
To: 2011-05-18 11:46 PM
Subject: Fracking in NS

I support the following viewpoints on Fracking in NS

Stop Fracking In Nova Scotia believes the government’s proposed review does not ask the right questions and takes too narrow a view. We believe that fracking needs a full evaluation in order to protect our environment, our health, our economy, and our rural quality of life.

Send your comments about the fracking review to the government - they say they want to hear from the public. Let them know their proposed review is not good enough.

Here are 6 key points you may want to include in your response.

1. Nova Scotia’s “Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia” as presently defined skips over the essential question, “Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?” The scope of the review should start from this essential question.

2. Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, <http://nslegislature.ca/legc/statutes/envromnt.htm> (http://nslegislature.ca/legc/statutes/envromnt.htm,) and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

3. The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

4. Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. (A fuller list of issues is available at <http://www.stopfrackinginnovascotia.ca/>) http://www.stopfrackinginnovascotia.ca/, click on Take Action)

5. The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to “make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province.” <http://www.gov.ns.ca/nse/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf> www.gov.ns.ca/nse/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf
6. Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

Thanks

Paul Fraser
From: Corey Kaye
To: <frac-review@gov.ns.ca>
Date: 2011-05-19 1:05 AM
Subject: Comments: Hydraulic Fracturing


Please stop, we know there are numerous concerns with this "new" technology and the chemicals used/forced into the ground water.

I'm very concerned about this technology and wouldn't want it in Nova Scotia.

Corey Kaye
Hello,

My names is Eric Antolick. I am taking time out of my day to e-mail you about a concern I have in a practise going on in nova scoita. This practise is hydraulic fracking, through my own research I have discovered that this practise of extracting Natural gas, is the least bit natural. In fact it is very harmful to the watershed, ecosystems in the area, as well as having a negative effect on the environment in general. It just does not seem right that people are pumping thousands of gallons of water, which are mixed with sand, as well toxic chemicals. I realize that the waste water is supposed to be collected and deposited properly, but there is absolutely no way they can get all the water. It is leaching into the watershed, it is bound to eventually contaminate people’s well water and drinking water. In Alberta there have been tests on well water nearby fracking sites, in which they found chemicals such as ethane, methane, and benzene in the drinking water. I ask you how long will we wait to stop this environmental and health disaster, it will only take time before people are feeling the effects of leached chemicals. Through common sense I can already attest that the ecosystems in the area are already feeling the effect. So in conclusion I must say that I 100% disagree with fracking ti needs to stop now. So I pressure you, the minister of environment be a voice of change. Be the voice that says NO. We will not exploit the environment for cheap resources. Thank you for your time, I hope to receive a response with your opinion on the matter. Thank you have a good day.

Eric Antolick
From: John Cascadden
To: Premier Nova Scotia <PREMIER@gov.ns.ca>, "Hon. Sterling W (ENV) Belliveau...
CC: <letters@herald.ca>, <info@halifaxnewsnet.ca>, <dguy@ottawacitizen.com>
Date: 2011/05/20 1:16 PM
Subject: Shale Gas is not the Best Energy Resource for the Future

Good day,

Lately I have read one article and two reports that make me wonder why anyone would allow shale gas exploration to take place in their region at this time. The reports have been done by respected scientists. I ask that you read them, and take their messages to heart.

The first report is co-authored by a well known toxicologist, Theo Colborn, the report is titled "Natural Gas Operations from a Public Health Perspective", here is a link to the report: http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf

Next is an article,"Debunking the 'Shale Gale': Industry has 'overblown' the benefits of shale gas, according to a new report." Here is a link: http://thetetee.ca/Opinion/2011/05/16/ShaleGale/.

The report associated with the article was written by J. David Hughes "Will Natural Gas Fuel America in the 21st Century", it can be found here: http://www.postcarbon.org/reports/PCI-report-nat-gas-future.pdf.

Note this quote from the article above: "Hughes is no wide-eyed greenie or industry basher. He happens to be one of Canada's most credible energy scientists. The geologist worked for Natural Resources Canada for 32 years and mapped Canada's coal and coal bed methane fields. He has also served on Canada's Natural Gas Potential Committee and is regarded as one of the continent's top global energy analysts."

These documents are but a few of the many credible scientific papers that exist today which counter the Natural Gas Industry claims that shale gas recovery, and production have nothing but positive benefits for the public, the economy, and our future. Natural gas is not a sustainable energy resource. We have to stop listening to an industry whose sole purpose is to make dividends for their shareholders; providing energy resources to the public is only a goal this industry supports if it provides a monetary return. They are not good stewards of the economy, environment or healthcare.

It should be noted that it is not just the millions of gallons for water that are corrupted for each shale gas hydraulic fracturing operation, or the potential for other clean water resources to be contaminated when trying to remove the fracturing fluid contaminants at water treatment facilities, but also the air quality, soil contamination, deforestation to support drill pad/service road/pipeline developments, increase heavy vehicle traffic, noise pollution, changes to way of life for local communities, green house gas emissions, and additional risks from fire related incidents... just to name a few additional areas of concern related to shale gas recovery operations. It takes a lot of wells to do an economic shale gas recovery operation, and it affects a large geographic area when implemented.

A moratorium to stop all shale gas hydraulic fracturing operations whether for exploratory, or production purposes should be enacted immediately. Any reviews concerning shale gas hydraulic fracturing processes should be secondary to the moratorium.

We have to stop focusing on finite fossil fuel resources, and become leaders in developing and utilizing sustainable renewable energy technologies. Do not say it, do it!

To facilitate this goal, the following should occur immediately: Transfer all the tax breaks and incentives that are presently given to the fossil fuel industry companies, and give them to developers of sustainable renewable energy technologies. Provide financial support to universities, and colleges that do research and development of sustainable renewable energy technologies. This will help to ensure our future energy requirements will be fulfilled in a manner that is safest for the public, and the environment.
If this is not done immediately, it means that the required sustainable energy resource solutions will possibly NOT be available when fossil fuel energy resources start to bottom out worldwide. When that happens, our one time friendly trading partners will start hoarding their depleting energy reserves for their own use, and because we will have given away all of our own fossil fuel resources by that time; we will have nothing to fall back on... this is not a fairytale, once a finite resource is depleted, it is gone (hence the term finite).

This NOT the time to panic; it is the time to ACT!

Best Regards, John Cascadden
From: <frac-review@gov.ns.ca>
To: 
Date: 2011-05-24 5:21 PM
Subject: Fracking

Hello,

As you know there is talk of exploring underground gas in Nova Scotia by the process of hydraulic fracturing in shale gas operations.

I consider this a very dangerous practice. In the States, towns that have allowed this type of exploration have had their water supplies contaminated as well as the air. People can light the water on fire coming out of their taps!!

In France, the government has halted all exploration due to the many protests in the streets.

However, Nova Scotia has a large untapped resource for gas which companies are after.

What can happen?

- contaminated well water - due to punctures to the water table

- contaminated air - due to the evaporating of the ponds which hold the contaminated chemical filled water used in the hydraulique fracking. The company is supposed to haul away the contaminated water but that costs a fortune so often they install huge fountains in the ponds which spray the water into the air to accelerate evaporation. The water evaporates but the heavy metal particles fall to the ground contaminating fields and gardens.

- overuse of the water table - tons of water must be used to the fracking
I am strongly opposed to this form of exploration and mining. There are cleaner, renewable sources of power that must be implemented.

Thank you. Andrew Connolly
From: <frac-review@gov.ns.ca>
To: 
Date: 2011-05-24 7:29 PM
Subject: My Opinion of Hydraulic Fracturing

Greetings,

I have listened to several CBC shows on the advantages and disadvantages of Hydraulic Fracturing. I have looked at both sides of the issues surrounding the practice and I am NOT in favour of this being an industry in Nova Scotia.

Cheers,
Cheryl Tardif
Victoria Vale
Greetings again,

My submission only mentioned the CBC. Anyone can listen and even download the shows.

Cheers,
Cheryl Tardif
Victoria Vale

---- FRAC-REVIEW FRAC-REVIEW <FRAC-REVIEW@gov.ns.ca> wrote:
Thank you for your submission. Your comments will be reviewed by staff from the Nova Scotia Departments of Energy and Environment as part of the province's review of hydraulic fracturing in shale gas operations.

PLEASE NOTE: All submissions from the public will be posted on the Nova Scotia Department of Environment website and will be available for public viewing. You should not include the names of other parties or any other information from which other parties could be identified, unless their permission has first been obtained. As well, if you wish to submit confidential information, or other information that would normally be protected under the provisions of the Freedom of Information and Protection of Privacy Act, separate this information and clearly mark it as such. Even if information is marked as confidential, the Freedom of Information and Protection of Privacy Act may require us to release the information to an applicant under the Act.
From: John Gillis
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 5/25/2011 1:28 PM
Subject: Letter

May 25, 2011
Dear Team of Senior Technical and Policy Staff:

My name is John Gillis.
When the onshore permits were issues for this vast tract of land in circa 2004 the vast majority of local residents were not even aware of the fact until some years later – 2009 or so.

Successive Nova Scotia governments (as in PEI as well) have not done proper or meaningful consultation with local residents - hence the frustration felt by many who have spoken out against fracking and oil and gas development.
In fact, when provincial government officials did come here on a couple of occasions they were accompanying PetroWorth company officials in a very supporting role - which indicates again a conflict of interest for the government's Energy Department which is also the “de-facto regulator” that is supposed to be looking out for the concerns and interests of citizens, residents and taxpayers in the province.

Energy officials assure us that “best practices” will be adopted and that no plans for fracking have been made yet we see nearly daily numerous problems with the industry across the rapidly expanding shale gas exploration region in North America and beyond.

I also have serious concerns about the financial stability of the companies involved - - PetroWorth and Orca Power are essentially penny stock companies with hardly an impressive record of achievements. They may only stand to gain from speculative interests on the stock market with little or no concern for the impact on the local area, investors or residents or the Province for that matter. You need only witness the guilty verdict in the decade long Supreme Court MeteorCreek case in PEI (Wenger) to see that potential and note that one of the men involved in that case (David Fisher) went on to be a founder of PetroWorth.

There are numerous other health and environmental risks to these ventures – impacts on local tourism, quality of life, fishing, farming, forestry just to mention a few. The large scale use of water for the fracking process is another very serious concern including the disposal of this water and the fracking chemicals involved.

Why risk that already exists here for so little chance to gain and so much risk for the profits of a such a very select few?
Inverness County Council heeded the concerns expressed from many of the local residents that were so well expressed in the presentation by the local chapter of the Council of Canadians. It's time for the provincial and federal governments to do the same.

I urge you to say no to fracking and oil and gas development onshore on Cape Breton Island and Nova Scotia.

Thank-you.

John Gillis,
From: "Mary Jane Vaughan
To: <frac-review@gov.ns.ca>
CC: 
Date: 5/25/2011 2:05 PM
Subject: My comments

My name is Colchester county Nova Scotia. This is one of the areas where hydraulic fracturing ("fracking") for shale gas is proposed. I wish to submit my comments regarding the proposal to engage in hydraulic fracturing in Nova Scotia.

I am concerned that the scope of your draft review is not broad enough.

I ask the government to include other effects of "fracking" such as
- the stress on our roads and infrastructure with heavy truck traffic,
- the source of the water for injecting in the drill holes,
- Safety Data sheets on the "fracking" chemicals and will the public be informed?
- the effects of air, water, noise and light pollution on the environment and affected residents.
- the devaluation of our properties as a result of operations nearby
- compensation to property owners whose property has been devaluated and/or
- who have suffered other losses such as enjoyment of property, contaminated well water, air pollution, noise pollution, light pollution etc.
- establishment of buffer zones around fracking operations

Will the government require a full environmental assessment for each proposed fracking operation including public consultation?

Respectfully submitted,

Mary Jane Vaughan
From: Nina Newington
To: <frac-review@gov.ns.ca>, <premier@gov.ns.ca>, <MIN_ENV@gov.ns.ca>, <ENER...
Date: 5/25/2011 3:20 PM
Subject: Review of Hydraulic Fracturing

Dear Senior Technical and Policy Staff Team,

I live in Mount Hanley, Nova Scotia. Thank you for requesting comments on hydraulic fracturing. I am very concerned that 4 test wells have already been subjected to hydraulic fracturing in Hants County and that the province signed a production agreement in April 2009 with a company that specializes in hydraulic fracturing. That company, Elmworth Energy, is owned by Triangle Petroleum. Triangle state on their website that they hold the lease to 475,000 gross acres of our province.

My concerns are many, starting with the safety of our water supply. In the US, hydraulic fracturing has led to water wells being contaminated with methane and with chemicals used in 'fracking fluids.' In what is described as 'the most comprehensive national assessment to date of the types and volumes of chemical used in the hydraulic fracturing process,' a report prepared for the US Democrats House committee on Energy and Commerce in April 2011, 'shows that between 2005 and 2009, the 14 leading hydraulic fracturing companies in the United States used over 2,500 hydraulic fracturing products containing 750 compounds. More than 650 of these products contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or listed as hazardous air pollutants. (p.12)

Hydraulic fracturing companies used 2-butoxyethanol (2-BE) as a foaming agent or surfactant in 126 products. According to EPA scientists, 2-BE is easily absorbed and rapidly distributed in humans following inhalation, ingestion, or dermal exposure. Studies have shown that exposure to 2-BE can cause hemolysis (destruction of red blood cells) and damage to the spleen, liver, and bone marrow. (p.7)

The hydraulic fracturing companies injected 21.9 million gallons of products containing 2-BE between 2005 and 2009. (…) EPA recently found this chemical in drinking water wells tested in Pavillion, Wyoming.' (p.7)


In Canada, Jessica Ernst is taking Encana, the Province of Alberta and their Energy Review Board to court for the contamination of her well water in Rosebud, Alberta following hydraulic fracturing of coal bed methane wells nearby. Coming still closer to home, we learned on 24th May that Southwestern Energy, a company intending to drill for natural gas using hydraulic fracturing techniques in New Brunswick, is the subject of a class-action lawsuits by residents of Arkansas whose wells have been contaminated. Residents of Pennsylvania are seeking damages from that company on similar grounds.

Hydraulic fracturing uses huge volumes of water. As an example, to frack one test well, Kennetcook #1, drilled in Hants County in August 2007, Triangle used 1.5 million gals water. This was mixed with 960,000
tons sand and an undisclosed quantity of chemicals. Usual industry practice would be for the volume of fracking fluid to equal 0.5-2% of the water volume, so 7,500-30,000 gallons of chemicals. The chemical make up of the fluid is not reported.

Hydraulic fracturing produces large volumes of waste water contaminated not only by the chemicals added to the water but by substances such as heavy metals found deep in the bedrock where the water is pumped to fracture the gas-bearing shale. This waste water poses a threat to surface water. In the US the New York Times has reported on major issues in Pennsylvania where Municipal Waste Treatment Facilities, which lack the means of testing for radioactivity, have been disposing of radioactive ‘flow-back water’ in rivers and streams.

Here in Nova Scotia we have arsenic and uranium in the bedrock in many parts of the province including areas of the Maritime Sedimentary Basin where shale gas is also to be found. Kennetcook #1 was drilled 1358m deep. The company retrieved 66% of the water from this well plus chemicals and, quite probably, radioactive material. That one million gallons was disposed of somewhere. Does the sole Hants county Municipal Waste Treatment facility even test for radioactivity in waste water?

Then there’s the half a million gallons of water and chemicals that remained in the ground. While the well was deep, it is in the nature of fracking that the impervious shale is cracked. It is extremely difficult to know where those chemicals will migrate to. In addition the methane released from the shale travels along the fractures in unpredictable ways. The Bay of Fundy as well as the Kennetcook and Walton rivers are nearby. The Inner Bay of Fundy Atlantic salmon that spawn in those rivers are an endangered species.

Given the level of threat hydraulic fracturing poses to our most precious and irreplaceable resource, fresh water, a review of the sort currently being conducted in Nova Scotia is inadequate. We need a comprehensive Strategic Environmental Assessment. This should offer public meetings around the province for citizens to learn and express their concerns about hydraulic fracturing. Such a review should consider the environmental, economic and social consequences of hydraulic fracturing, including its impact on the tourism industry.

Hydraulic fracturing results in the industrialization of rural landscapes. In the production lease application that was approved by the province in 2009, Triangle’s vision for the Windsor Block included drilling up to 100 wells the first year then 80 wells per year for 7 years. That means over 600 wells pluspipelines, separators, storage tanks and processing plants. There would need to be aprocessing plant with a compressor every 5 square miles.

All this construction would create some jobs but the benefit would be short-lived. In its production lease application, Triangle anticipates a 50% depletion rates for its wells by the end of the first year of production with a further 50% depletion each year after that until the fifth year when the depletion rate levels out to 10% a year. Even this steep decline in production may be over-optimistic. In the US a 75% drop in production by the end of the first year is apparently common. Given the royalty holiday the province currently offers for the first
two years of production, it seems unlikely that Nova Scotians will benefit even in purely fiscal terms. Certainly we will not benefit from the environmental devastation we will be left with when the energy companies have shuttered the wells, declaring them no longer economical.

As to the industry’s claims that the natural gas they produce through hydraulic fracturing is a clean fuel, a way to reduce our greenhouse gases while we transition to renewable energy sources, a recent study by scientists at Cornell found that, when methane leakage from well casings and other sources of contamination are taken into account, hydraulically fractured natural gas is as dirty as dirty old coal. If, from reducing our greenhouse gases, it is to conventional gas as tar sands oil is to conventional oil: a particularly dirty form of an already polluting fossil fuel.

In the light of all this, the question under review must not be how to regulate hydraulic fracturing but whether the practice should be permitted at all in Nova Scotia. The governments of France and South Africa have banned the practice as being too risky. We need a complete moratorium on all hydraulic fracturing in Nova Scotia, whether for exploration or production, until a comprehensive Strategic Environmental Review has been conducted and has found that hydraulic fracturing can be done safely and is worth doing.

The Minister of Energy wrote recently, in response to concerns expressed about fracking, “I can assure all Nova Scotians that if a proposed activity has not demonstrated that it can be done right, it will not be approved.” I very much hope that he lives up to his word and that the NDP government shows the leadership in environmental matters that so many of us hoped for when we gave it a majority in this province.

Nina Newington
HI Virginia,

For DoE. Have sent response from this office

KJ

Constituency Assistant
MLA Shelburne County
The Honourable Sterling Belliveau
Minister of Fisheries and Aquaculture, Minister of Environment
P.O. Box 595
Barrington Passage, NS
B0W 1G0

Phone: 902-637-3200
Fax: 902-637-3530
Email: <mailto:mlashelburne@eastlink.ca> mlashelburne@eastlink.ca

** Please note: this email is confidential and meant for the intended recipient only. If you received it by mistake, please let me know immediately. Thank you. **

———

From: Jan Watson
Sent: May 25, 2011 12:54 PM
To: mlashelburne@eastlink.ca
Subject: Gas Exploration

Dear Mr. Belliveau,

Please be kind enough to read the following story and check out the links below.

The Sad Story of Greed and Cruelty in a Rural Province of Canada

"Once upon a time there was a happy country, full of lovely trees, bright rivers and beautiful meadows, where a healthy community lived with common sense and gentleness. One day a group of ogres arrived. They were big and powerful, sly and full of lust. "We have come to rape your daughters" they declared in loud voices. "Oh no please don't rape our daughters!" said the community "they are our earth, our source of nourishment, joy and happiness. They feed us, they nurture the animals, and they vital for our survival"

"We have come to rape your daughters because We Want Them and our god says it will Make Us Rich." said the ogres even more loudly. "But because of your silly squeamishness we will use condoms to prevent all your unrealistic worries. It is perfectly safe, Perfectly Safe!"

The community of common sense was powerless in the face of such a rude
force. The ogres were very large and very insistent they pushed aside the kind elders and repeatedly raped all the daughters they could lay their hands on. Of course the condoms were useless and broke easily under such pressure. The raping of the daughters gave birth to great ugliness, poisoned fields, contaminated rivers, polluted air, deformed children and distorted livestock, the trees died. The good common sense was lost and the community was ruined." And the moral of this story is NO Fracking. NO Fracking in Nova Scotia.

Fairy Stories are allegories but they are always true to life - as it is lived. Therefore I urge you, as a person dedicated to the service of our great province of Nova Scotia, to please study the links listed below and watch the Gasland Movie to enable you to further understand the dangers of the exploration and extraction of natural gas.

This says it all ...funnily. Please watch it...very short.

<http://www.youtube.com/watch?v=wJ7kt51Jc>
<http://www.youtube.com/watch?v=wJ7kt51Jc>

Current and on going information
Stop Fracking in Nova Scotia Website.
NS Exploration, News, Environment, Accidents Videos, protests, politics and maps and much much more. Includes Links to: Does Fracking Cause Earthquakes?: Montreal Gazette report on 19 gas well leaks in Quebec: Reservoir level depletion; and how much water used in fracking.
<http://www.stopfrackinginnovascotia.ca/environment.html>

Proof that Hydraulic Fracking contaminates wells
Higher levels of methane found compared to control wells. Recommend long term monitoring and stewardship for contamination.
http://www.pnas.org/content/early/2011/05/02/1100682108.full.pdf

Fractured Lines: Will Canada's Water be Protected in the Rush to Develop Shale Gas? A programme on Water Issues at the Munk School of Global Affairs U of T by Ben Parfitt. Excellent report. Detailed and thorough looking as gas revolution, the argument for security, the impact on water quality and quantity, and the disposal of wastewater, regulations, Canada's dependency on water and a letter from Henry Waxman Chair of Ctte on Energy and Commerce House of Representatives US.

"Gasland" a Sundance Award Winning Movie by Josh Fox. Depicts the dangers and difficulties in extracting gas from the shale bed. Informative, explicit and accurate. A must for all interested or involved in making decisions concerning permits for exploration.
<http://stagevu.com/video/gqjurcfjrwge>
<http://stagevu.com/video/gqjurcfjrwge>
<http://stagevu.com/video/gqjurcfjrwge>
<http://stagevu.com/video/gqjurcfjrwge>
<http://stagevu.com/video/gqjurcfjrwge>
<http://stagevu.com/video/gqjurcfjrwge>
With thanks

Jan Watson
Hydraulic Fracturing Study  
Environmental Science and Program Management Division  
Nova Scotia Environment  
PO Box 442 Halifax NS  
B3J 2P8

Comments on Draft Scope Document

We commend the Government of Nova Scotia for this opportunity to comment on the use of fracking in this province. As retired geologists with many years experience in teaching and research (IMH in the oil and gas industry), we offer the following.

Nova Scotia is in a fortunate position to make decisions on the use of hydraulic fracturing in this province, for there is an extensive literature on the topic and many documented experiences in other places. Some of these provide evidence of problems that indicate great caution should be applied.

The most important requirement for any new project involving fracking is that the area to be explored should be thoroughly studied in advance of approval being given. A requirement should be that all existing wells in the area are monitored for water quality and flow. Determining quality involves identifying and tracking over at least some months a wide range of metals, gases and even organic compounds. The monitoring should extend over and beyond the entire area beneath which fracking may occur. Many of the disputes exposed in the film “Gasland” could have been resolved had good baseline data been available.

One of the NSE documents seems to imply that because most groundwater aquifers are near-surface whereas shale gas deposits are much deeper, there fracking should not be a concern. While this may be the case in some places, there are many areas in NS – including Hants County – where fractures, faults and shear zones extend upwards to the surface from considerable depths. Because such pathways are commonly far from vertical, migrating fluids may reach the near-surface some distance from the rocks being fracked. This is indicated on many geological maps, and also evidenced by hot springs that emit waters moving from depth.
In short, there are many ways for fracking fluids and released gases to move towards the surface and cause problems for shallow groundwater supplies. A recent study of the gas-bearing Marcellus shale of Pennsylvania shows that methane originating from depths greater than 1000 m does contaminate wells tapping shallow aquifers (Osborn et al, 2011, Proc. National Academy of Sciences, volume 108, number 20).

Not only can wells be contaminated, but there is also the risk that surface ponds, rivers and wetlands, and their ecosystems could be harmed. Rivers, for example, commonly flow along valleys that follow fault, fracture or shear zones. Soil quality may also be reduced.

The chemicals used in the fracking process need to be very closely monitored by government personnel, and why they are being used explained publicly in clear and succinct terms.

If the NS Government decides to permit fracking to be used here, it must accept the responsibility of identifying any changes to the local and regional hydrology. Requiring the exploration or production company involved, or any other private sector firm, to collect the baseline data and to monitor any changes occurring after drilling and fracking commence, is likely to raise suspicions among the concerned public. Any responsible government must be able to assure a sceptical public that it has done the proper background work and that it will continue to monitor the situation directly, not pass the responsibility to the private sector.

Either Nova Scotia should have a public service capability to carry out this work, or it should not be allowed.

Yours truly

Antony R. Berger, Ph.D.

[Signature]
From: Jessica Metter
To: <frac-review@gov.ns.ca>
Date: 5/26/2011 12:05 PM
Subject: Hydraulic Fracturing Review

26 May 2011

Dear Team of Senior Technical and Policy Staff,

Thank you for inviting Nova Scotians to express our thoughts about hydraulic fracturing. Over the past several months I have been seeking to become informed about this issue.

Prior to allowing hydraulic fracturing in Nova Scotia, we would need to consider:
- the volumes of fresh water which would be diverted from bio-systems
- the risks associated with the chemicals mixed with the water at all stages of the process
- the loss of land and vegetation
- the effect on aquifers, groundwater flow, wellwater integrity.

I acknowledge that methane is one of the more efficient fossil fuels. However, the procedures and economics of hydraulic fracturing suggest that, like tar sands exploration, that this would represent going after the more difficult and more costly fuel. At the end of the day, money spent on developing this industry would still result in an adverse carbon footprint. It would be wiser to devote our financial resources and scientific expertise to alternative energy sources which will place Nova Scotia in a better position to compete in a post-carbon economy.

During the 1970s, I remember listening to the dioxin hearings broadcast by CBC Radio daily from Cape Breton. Over the course of months, I heard categorical denials by industry that dioxins posed any threat whatsoever to human health. Sadly, we now know this to be utterly false.

The potential effects of hydraulic fracturing on the integrity of aquifers and groundwater, spillage of toxic waste, well water quality are far-ranging. It behooves government to understand the consequences on human health and ecosystems prior to sanctioning this industry.

The aspect of hydraulic fracturing which is of greatest concern to me is the vast volume of water that would be pumped underground. (I have heard it reported that one site pumped a volume of water equivalent to the water usage of Victoria, B.C. on a daily basis). Most reports I have seen estimate that up to 90% of this water mixed with toxic chemicals is not recovered. It defies common sense to think there would not be an untoward consequence at some unknown future time. Already, the results of mining by the Elmworth Energy Corporation near the Minas Basin, confirm that the geological substrate conditions resulted in the commingling of groundwater and natural gas in this area.

Fresh water, like oxygen, is one of our most precious natural resources, essential to all life. I urge you to place a 5 year moratorium on hydraulic fracturing in Nova Scotia while conducting the scientific analysis necessary
to understand the costs to us all.

Again, I thank you for the opportunity to express my concerns on this issue.

Sincerely,
From: "valerie starratt"
To: <FRAC-REVIEW@gov.ns.ca>
Date: 5/26/2011 4:03 PM
Subject: No to Fracking

Please do not allow this process to be conducted in NS. We have a beautiful landscape and do not want it destroyed. We do not agree with this being done.
Regards
Bob & Valerie Starratt
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 5/27/2011 2:50 PM
Subject: Fracturing for Natural Gas

Mister Minister,
It is my belief that fracturing is not safe and should not be allowed in Nova Scotia. The only real attraction for this work is the jobs it brings and the government royalties. Is this a fair trade off for threatening our environment? I think not. Too often the environment takes a back seat to corporate greed and profit. Ground water is too precious a commodity to risk contaminating it in any form. Recent reports also indicate this form of gas is not beneficial to the ‘green’ theme. It is my hope this government will not proceed with any plans to develop gas with this method.

Thanks
C. Webber
From: Alexandra Gilbert
To: <frac-review@gov.ns.ca>
Date: 5/28/2011 8:58 AM
Subject: No Hydraulic Fracturing

Nova Scotia Environment,

As a former resident of Wolfville, Nova Scotia, I am very concerned about the potential environmental impacts of hydraulic fracturing in the province. Hydraulic fracturing uses vast quantities of fresh water, which affects the water table, and the chemicals used in fracking fluid contaminate ground and surface water as well as soil. Please look into more environmentally sustainable ways of developing Nova Scotia’s economy.

Thank you,

Alexandra Gilbert
From: Linda Weatherbee
To: <frac-review@gov.ns.ca>
Date: 5/28/2011 10:39 AM
Subject: Nova Scotia Scope Review
Attachments: FRACKING letter.rtf

Please find attached a letter concerning FRACKING in Nova Scotia.

Linda Weatherbee
Hydraulic Fracturing Study
Environmental Science and Program
Management Division
Nova Scotia Environment
P. O. Box 442
Halifax, Nova Scotia
B3J 2P8

In the 1970's, smoke from the Springhill “Duff Banks” was so strong driving past the area was like driving through a forest fire zone. Little thought was given to what the coal mining industry was responsible for when the industry came into an area. The left over slag, a by-product from coal mining was dumped in what is called “The Company Field.” As a result people, picking coal from the mine waste, started fires to keep warm. These fires spread underground and although they are not as active today, small plumes of smoke still wafts through the air. Little vegetation grows in the area as it appears sterile without growth of trees.

We now know that climate change is real, enough scientists are providing logical data that people cannot ignore it. Our elected government officials, representing all the people of Nova Scotia, has a responsibility to ensure due diligence is carried out. As the quote taken from “There is No “Away”,” states: “Let each person - human person or corporate person - so use his own property as not to injure that of another, particularly so as not to injure that which is the common property of all mankind. …Victor J. Yannacoone.

I am asking that a thorough review be carried on fracking, taking into consideration the following points.

Nova Scotia’s "Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia" as presently defined skips over the essential question, "Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?" The scope of the review should start from this essential question.

Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) it, (http://nslegislature.ca/lege/statutes/envromnt.htm), and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life.

The scope of the review should allow for all possible outcomes, including a ban on fracking
because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to "making recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." www.gov.ns.ca/nse/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf

Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

Please keep me informed on the steps being taken by the review board.

Sincerely,

Linda Weatherbee
From: Dorothy Harroun
To: <frac-review@gov.ns.ca>
Date: 5/28/2011 8:57 PM
Subject: fracturing study needed!

Hydraulic Fracturing Study

Environmental Science and Program
Management Division
Nova Scotia Environment
P. O. Box 442
Halifax, Nova Scotia
B3J 2P8

In the 1970's, smoke from the Springhill "Duff Banks" was so strong driving past the area was like driving through a forest fire zone. Little thought was given to what the coal mining industry was responsible for when the industry came into an area. The left over slag, a by-product from coal mining was dumped in what is called "The Company Field." As a result people, picking coal from the mine waste, started fires to keep warm. These fires spread underground and although they are not as active today, small plumes of smoke still wafts through the air. Little vegetation grows in the area as it appears sterile without growth of trees.

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(b) Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, (http://nslegislature.ca/legc/statutes/envromnt.htm,) and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.
(c) The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

(d) Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life.

(e) The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to "making recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." www.gov.ns.ca/nse/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf

(f) Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

Please keep me informed on the steps being taken by the review board.

Sincerely,

Dorothy Harroun
From: <frac-review@gov.ns.ca>
To: 5/29/2011 12:55 PM
Subject: Hydraulic Fracturing

Stephan Hederich

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment

P.O. Box 442

Halifax, N.S. B3J 2P8

May
28,
2011

Dear Ministers,

the NS Minister of Energy said:

Quote:

"The oil and gas industry is an important part of our energy future as we diversify our energy mix to ensure greater price stability and security of supply. Renewable energy sources will not replace fossil fuels in our lifetime, and oil and gas will continue to be used in our daily lives and in assisting us in balancing the intermittent nature of our wind and tidal resources."

The natural gas extraction that your government has offered for bids -and has subsequently received two bids for- has little to do with the security of our own domestic needs. Rather the greatest bulk of it is to be marketed abroad. This information is part of the bid that "Elmworth Energy" submitted to the NS Dept. of Energy, of which you are the Minister, at least at the moment.

This bid refers to the "Windsor block".

The NS Minister of Energy also state, that

"renewable energy sources will not replace fossil fuels in our lifetime".

Looking at the activities of the NS Department of Energy, I can only believe that the NS Department of Energy is doing its utmost to make this come true.

It is very disappointing to observe your department making all efforts to
sell the energy resources of Nova Scotia without any need for it and, how
that is selling future Nova Scotia generations for a "penny". Statements
by the "Triangle Corp" indicate that the Nova Scotian Government agrees to
sell our resources for only 10 % royalties. The province of Alberta
claims royalties of an average of 17.5 %.
Is your home province worth so little to you, or do you have other
interests in this case?

You also state the following:

Quote:

"I'd like to point out that we believe that the oil and gas industry can
play an important role in providing economic development opportunities and
creating good jobs"

Please allow me to refer to the above-mentioned bid for the "Windsor block".

Elmworth Energy is estimating approx. 100 jobs during the construction
phase of the gas extraction and approx 15 to maintain up to 300 wells.

Since the NS government has kept its citizens in the dark regarding the
true nature and volume of the planned activities in the Truman, Scotsburn
and Malagash blocks, I can only extrapolate the same job promises for our
area.

I strongly believe, therefore, that the jobs that will be lost in
agriculture and tourism alone far outnumber the jobs that you are
promising.
The NS Minister of Energy are promising "good" jobs. Rather good jobs will
be destroyed first and then, maybe, a few new ones will be created.

I also would like to stress that nobody that I know of believes in the
"job drum" that your class, the political class, always beats when you are
trying to "sell" something questionable to us, the people.

Promising jobs is nothing but an act of despair. I would like to appeal to
your genuineness and ask you, kindly, not to do that any more. Please!

Dear Ministers, I am well aware that 90% of all onshore natural gas
extraction these days is done by the process of "fracking". I am sure,
that it is not necessary to explain what is meant by "fracking". By this
measure, there is therefore a 90% chance that any natural gas extraction
in Nova Scotia would be done by "fracking". "Fracking" has been done in
Nova Scotia in the past, as early as 2007 and as recent as 2010.
"Elmworth" or companies hired by "Elmworth" have done so called "micro
fracs" in order to explore the potential of the "Windsor Block" in the
first half of the last year. And even if you say that there are no bids
for "fracking", we know, that your department has received two bids for
onshore gas exploration for the North Shore of NS. Once these companies
will decide, that "fracking" would be their choice of exploration, they
will apply for that, just as companies did in the Windsor Block. Are you
saying, that you may maybe then deny them "their success" after you have
let them explore in the first place?

Nobody can truly foresee the risk that is inherent in the process and
nobody can foresee the dangers to future generations. Pumping toxic chemicals underneath aquifers is madness and everybody who claims that this has no (negative) impact on the environment is an idiot! For the simple reason that it is impossible to know or calculate the risk and only an idiot would suggest the possibility of controlling the unpredictable. Even the strictest environmental protection measurements will NOT be sufficient to deal with this potential risk. The only measurements that will anticipate this unpredictable threat to our environment and to our most important resource, the water, is a complete ban on "fracking", now and forever!

Dear Ministers, I am urging you to work towards this. It is in your hands to give the energy policy of Nova Scotia a turn towards a saner future. This province has such a blessed position and therefore opportunity on the globe to produce renewable energy, wind energy and I am convinced that it is possible to replace fossil fuel based energy completely during our lifetime (I am ). All it takes is bravery and a vision, and the strength to withstand the temptation of the fast dollar. These are all attributes of a true leader and a government should consist of true leaders!

Don't you think so, too?

Yours truly,

Stephan Hederich
From: Rene Prudhomme
To: <frac-review@gov.ns.ca>
Date: 5/30/2011 10:38 AM
Subject: hydraulic fracking

It's obvious to me that industry and government have already gotten into bed together, or this "review" of this ridiculous scheme would not be taking place. Plenty of evidence exists as to the dangers of "fracking". I would encourage you all to watch the documentary "Gasland". We will see soon enough where your allegiances lie. To the corporations, and the possibility of a little money, or to the people of this province. Is this to be your legacy? I certainly hope not. Water is too important to risk.

Sincerely, Rene Prudhomme
Dear Sir or Madam,

I am writing on my own behalf as a Nova Scotia citizen to urge you to permanently ban all hydraulic fracturing (fracking) activities in this province.

There are simply too many unknowns and factors impossible to control to consider this a safe practice. What do we really know about the "life" of our underground and how it might impact both humans and the rest of the environment? How do we know that things injected and cracks created will not have more subtle, long-term effects that our children or grand-children might have to deal with once they reach catastrophic proportions? Do we really want to take that chance? Haven't we taken enough chances already with conventional oil and gas exploration?

In addition, we all know for a fact that the oil & gas cannot be trusted. No matter what they promise about being environmentally friendly and being concerned about safety, we all know what the bottom line is, and it's not the environment and it's not safety. The oil & gas industry has always and will always do everything that they can get away with and then fight what they cannot get away with in the courts for decades, making it impossible to force them to adopt best practices and follow the most stringent guidelines. Do I really need to recap the news headlines from the last couple of years or indeed the last 100 years to illustrate this?

Finally, it seems obvious to me that the long-term goal for any government must be to eliminate our dependency on fossil fuels. Shale gas is a fossil fuel. The main effect of promoting/allowing its exploitation will simply be to delay the inevitable (we'll run out of fossil-fuel resources eventually) and further aggravate the already catastrophic impact of global warming. Gas might be "cleaner" than oil, but it's not that much cleaner, and there are tons of "hidden" environmental impacts that are either unknown or not taken into account. We have to stop using our planet as a gigantic garbage can and somehow assume that this garbage can is able to absorb an infinite amount of junk at no cost without any impact. It's totally irresponsible.

Sincerely,

Pierre Igot
From: Jan Watson
To: <frac-review@gov.ns.ca>
Date: 5/30/2011 1:21 PM
Subject: The Damage by Hydraulic Fracturing

To the Ministers,
Elected Representatives
and Officials of the Provincial Government of Nova Scotia,

Good Morning Ladies and Gentlemen,

First I would like to applaud you all for your selfless service to our great province. Such hard work is usually a thankless task with very occasional recognition, so please accept my thanks.

At this time may I draw your attention to the possibility of the Oil and Gas Exploration and Extraction in Nova Scotia. I understand that connections and potential bids are being SOUGHT with these type of companies but that there is no actual activity occurring in the province currently.

Whereas there is no doubt that the province badly needs income, the hazards of this particular remedy completely outweigh the advantages and are temporary at best. It has been proved, without doubt, that the techniques used in such exploration and extraction are very dangerous and cause serious and permanent contamination to water, air and soil and therefore the life and health of the citizens. Also that it produces an mere handful of temporary jobs at the local level.

And whereas regulations may be legislated, in practice they are unenforceable.

There is really no way around these simple facts - as common sense will verify.

Another practical and serious consideration is that the work of exploration and extraction is toilsome and heavy - particularly on the ROADS. Fleets of very large trucks, with tenders, repeatedly transport tonnes and tonnes of chemicals, water, gravel and other materials to the site of operation. Enormous mechanical vehicles and equipment, for drilling, pumping, withdrawing and impressing, have to be brought over the ROADS.

Recently in the Chronicle Herald there were two mentions of the already extremely poor conditions of our roads. On the front page on May 27th the CAA awarded Lower Maccan, in Cumberland County, a Silver Medal for having the worst road in Atlantic Canada. Several other roads in the area, including Colchester and Pictou Counties were runners-up. It is this area of the province which is targeted for oil and gas exploration and extraction. The next day in the Buzz - the Online Readers Poll - 1,784 people said that their road either needed fixing or completely repaving.

With these facts in mind is seems to be a veritable oxymoron and most unwise to proceed with such exploration and extraction for a short term gain.

Thank you sincerely for your attention to this matter

Jan Watson
From: ENVIROLIBRARY
To: Margueratt, Vanessa D
Date: 5/30/2011 2:37 PM
Subject: Re: Nova Scotia Environment Feedback Form Submission

Vanessa,

I spoke to Brent. He said to forward to you to keep with other comments that are coming in.

I have not responded to this letter.

Natalie
NSE Library

>>> 5/28/2011 10:00 PM >>>
name: Jane Florence Terry
e-mail:
comments: Gentlemen: I believe that fracking should NEVER be considered. It is only another way for rich oil and gas companies to get richer on the backs of the average person who has to use gas to get back and forth to work and get groceries. Some of us have given up practically all other driving because it is not financially feasible. If you think that half of poison in your drinking water is better than all, maybe you can only be half dead, half poisoned or live with only half cancer. We got along without without gas long before we got along water. Any idiot knows, no water, no life. Why are you even considering putting clean, pure water that provides life for all living beings over the all mighty buck? Yours truly, Another concerned Nova Scotian

Page Last Viewed:
www.gov.ns.ca/nse/pollutionprevention/consultation.hydraulic.fracturing.asp
From: ENVIROLIBRARY
To: Margueratt, Vanessa D
Date: 5/30/2011 3:47 PM
Subject: Re: Nova Scotia Environment Feedback Form Submission

>>> 5/30/2011 2:43 PM >>>
name: Denise MacIntosh
email:
comments: I just wanted to say my two cents on Fracking. Im totally AGAINST it. It pollutes water, earth, and air. I HOPE the NDP Provincial Government will NOT ALLOW this to happen ANYWHERE in Nova Scotia.

Page Last Viewed:
www.gov.ns.ca/nse/pollutionprevention/consultation.hydraulic.fracturing.asp
Respected Government Representatives,

I welcome the opportunity to make comment on the proposed scope of regulations regarding the possibility of fracking for gas (or oil?) in Nova Scotia.

First of all I would say that regulations are made to be broken. They are put in place to try to prevent people doing harmful things. It is a situation that tends to lead to misuse, especially in such an expensive and complex undertaking as fracking. There is always a tendency to cut corners, not all workers are thoroughly trained and accidents happen through carelessness or oversight or whatever. And old habits die hard.

Regulations for tighter controls on drilling and monitoring processes, for remediation for mistakes/accidents, for spoiled lands, polluted water, polluted air, loss of business/farming are followed on the part of the companies with an eye to cost savings and often in the breach with a court battle, with the most vulnerable people bearing the burden. And fundamentally nothing compensates for loss of well-loved land and lifestyle.

This is a small province. These are big companies with much more money to spread around than the province has.

Once damage has been done it is done - trucking in remedial water to a farm whose wells have been polluted, or being offered money for spoiled land adds insult to injury, makes us beholden to the big companies and in any case is plainly not a sustainable approach to running the Province.

However regulations are framed there is no real way to oversee or ensure their implementation such that there is power behind the words.

The companies have no real interest in cultivating the livelihood of Nova Scotians. Some money to be made and then they are gone. If they work to deadlines corners are cut and money is the bottom line.

WATER

Is certainly one of the main issues.
The companies and interested parties say the fracking wells are so deep there is no possibility of causing contamination of water closer to the surface.

There are three points to note here.

Some of the shale formations in Nova Scotia run pretty close to the surface and therefore water bearing rock could easily be disturbed by the pressure and explosions. Cracks extend upwards and gas and water and chemicals go up with the cracks and through the potable water layers.

Secondly, gas does seep up to the surface even from deep and undisturbed shale layers -that is one of the principal methods of exploration. Planes patrol in grids seeking for surface gas that has seeped up from deep formations, using at least a couple of technologies. Fracking those deep formations can only increase this natural seepage and that seepage goes through water bearing rock layers on its way to the surface.

Thirdly, the vertical drill hole is sheathed in steel to below the water table or sources of surface water and then the whole drilling hole is cased in concrete. This sounds good but rocks are not easily bored in such a way that concrete adheres easily and firmly. There is always seepage up the outside of the borehole between the concrete and the rock. People do pressure tests to try to avoid that - but it is never 100%.

So it is not true to say that groundwater would never be contaminated. It almost certainly would be - at first by gas and as time goes on by the chemicals in the fracking fluids. Each frack explosion and application of pressure will loosen the seal further.

HOW COULD THIS BE REGULATED? A scientist, a government employee - on site taking gas and air and water samples at the well head and in the local area. Who defines how much is too much? And then
what -more compensation?- for damage already done. Monitoring regularly even after the gas has been extracted and the company leaves or moves a couple kilometres away to another drilling site would seem a necessary precaution... And if the chemicals seep to the surface (through the potable water layers)after the company leaves?? who pays -more remediation? Additionally, where does all the water for fracking come from? From Nova Scotia or out of Province. Are there agreements with other Provinces that would adequately protect their water supplies?

CAN THERE BE ADEQUATE MONITORING AND REGULATION OF WATER TABLE LEVELS WHEREVER THE WATER COMES FROM? This has not been properly addressed in BC where some lake levels have been substantially lowered. Who can predict a particularly dry summer when often there is a shortage of water even with normal use. Then there is the whole issue of post-frac water -who cleans it up. I am not confident that that can be done adequately in Nova Scotia. The experience with the "composting" of sludge does not promise adequate attention. There is very little assaying for toxic components. It would cost too much. But some people put it on their land. We do not adequately regulate this industry which is already in use, and on a smaller scale than fracking would be.

HOW CAN POST-FRAC WATER BE MONITORED AND REGULATED? HOW MUCH DOES THAT COST THE PROVINCE?

ROADS
Who pays for roads? Do the companies build whole new road systems? Our existing roads are inadequate for a constant parade of heavy trucks to-ing and fro-ing. When the windtowers on Nuttby were being built there were people employed as traffic monitors on Hiway 311-regulating traffic since even moderate size trucks and farm vehicles could not pass some of the supply vehicles safely on some stretches of the road.. The long hill up from North River was backed up while large pieces of the towers were being transported. And it did result in overuse and damage to the shoulders. That was acceptable and short term. Companies can drill many wells on specially constructed concrete pads spaced apart from each other at twice the distance of the horizontal fracking drill -say 3-4 Kilometres apart. One company was promising 80 wells. Drilling and fracking could go on for months, even years. The main supply roads would be hazardous if not unusable for local traffic. A trip to Truro would become a major undertaking and who wants to buy blueberries from the fields lining the roads and spewed with diesel exhaust.

HOW COULD THIS BE REGULATED AND STILL MAINTAIN A SEMBLANCE OF NORMAL LIFE?

One truck tip over and spill into a small river such as the Salmon (what salmon) or the Waugh's would essentially ruin the river.

YOU CANNOT REGULATE FOR ACCIDENTS.
Maybe accidents can be overlooked to some degree if you have a very large area such as Texas (tho' some Texans might not agree) but Nova Scotia and especially the North Shore is small. Nowhere is more than 40 miles from the ocean. One good accident on a well travelled area could shut the place down. It is not sensible.

 Likely you have heard all this before by now so I am adding my voice to the chorus of protests. Fracking should not happen in this small area, whatever attempts may be made to regulate it.

However please take a moment to look at the aerial photograph below this letter and if you have more time look at the website also. They are from Arkansas and it is thoroughly documented. There is much destruction there and protest. Do we want the North Shore to look like this -a wasteland of unusable farmland? -so much for Canada's Ocean Playground.

I trust and hope that you will hear and respect the protest from your constituency. The proposition looks like long term pain for short term gain -if any at all-to me.

Respectfully,

Cicely Berglund PhD.
http://stoparkansasfracking.org/id7.html
From: <frac-review@gov.ns.ca>
To: 
CC: 
Date: 5/30/2011 3:26 PM
Subject: NO Fracking Way!!! BAN FRACKING NOW!

Hello,

Fracking is a stupid idea. It pollutes drinking water...there's only so much of that, and once it's gone...it's GONE!

Here's just a sample of what you get when you Google "fracking". It's NOT GOOD.

Sincerely,

D. MacIntosh

http://www.marcellusprotest.org/

A good site to show us Canadians how to FIGHT the corrupt Oil Companies...that lobby our corrupt government.


"The well blew near the surface, spilling thousands and thousands of gallons of frack fluid over containment walls, through fields, personal property and farms, even where cattle continue to graze." It happened on the 1 Year Anniversary of the Gulf Oil Spill. They claim these "fracking Chemicals" are a TRADE SECRET...so there is NO TELLING how dangerous they ARE!!!

http://www.guardian.co.uk/environment/2011/apr/20/shale-gas-fracking-question-answer

"Many shale deposits are buried under aquifers, and if the cement casing around the wellhole is not adequate, then the process of drilling and fracking can release the chemicals into the aquifer. Leaks of methane can occur, leading potentially to fires or explosions.

The water-chemical mixture pumped in gradually returns to the surface, where it can contaminate land and water. It can also be highly saline and contain solids, such as flakes of rock. Some companies have been accused of poor disposal of the sludge waste that results from fracking. In addition, the vast quantities of water used can lead to problems by depleting local ecosystems. There is also concern about the seismic activity involved in fracking.

These issues have prompted an outcry around the world, and some places are considering a ban – such as Pittsburgh, in the US, while New York called a halt to it pending a review. A bill to ban fracking in France has widespread popular support.

In the US, legal loopholes mean the fracking industry is poorly regulated, as large parts of it were taken out of the control of the Environmental Protection Agency (EPA) by President Bush, and companies do not have to disclose what chemicals they use."


"Fracking is a technology used by the oil and gas industry to access "unconventional" natural gas deposits trapped in shale, coalbed, and tight-sand formations – potentially at the expense of underground water
supplies.

After her well water was contaminated by nearby fracking in 2006, Ernst decided to go public, showing visiting reporters how she could light her tap water on fire, and speaking out about Alberta land owners’ problems with the industry, especially Calgary-based EnCana. EnCana is Canada’s second biggest energy company (after Suncor) and is now also a major player in British Columbia, with hundreds of natural-gas wells in the province.

Ernst, a biologist and environmental consultant to the oil and gas industry, says EnCana “told us ‘we would never fracture near your water.’ But the company fracked into our aquifer in that same year [2004].” By 2005, she says, “My water began dramatically changing, going bad. I was getting horrible burns and rashes from taking a shower, and then my dogs refused to drink the water. That’s when I began to pay attention.” More than fifteen water-wells had gone bad in the little community.

Tests revealed high levels of ethane, methane, and benzene in Ernst’s water. “EnCana told us they use the same gelled [fracking] fluids as in the States.” Fracking has become a huge controversy in the US, with pending legislation that would impact its regulation.

Ernst says she heard from “at least fifty other landowners the first year” she went public, and she continues to get calls. Groundwater contamination from fracking “is pretty widespread” in Alberta, “but they’re trying to keep it hidden.” Canada has no national water standards and conducts little information gathering about groundwater.” Alberta is waking up... We better not let these companies in AT ALL!


“According to the Cornell University study cited by Lakhani, methane is a more dangerous greenhouse gas (GHG) than carbon dioxide.

Caution

“Methane is a powerful greenhouse gas, with a global warming potential that is far greater than that of carbon dioxide, particularly over the time horizon of the first few decades following emission.

“Methane contributes substantially to the greenhouse gas footprint of shale gas on shorter time scales, dominating it on a 20-year time horizon,” the study says.

Lakhani urged caution of shale gas exploitation, saying that there was little evidence that the process was safe.

“Earthlife Africa’s position is actually quite simple: Until there is scientific evidence to confirm water pollution and the point that the water is at a shallower level than the gas is of indeed more concern both because of the potential break in integrity in the fracking cement lining and from the actual escape of the fracking water.”’’ Hummmmm, fracking is WORSE than COAL! We are better off burning our dirty coal then allowing oil companies to drill this swill and leave us an environmental disaster!
From: Gerri Robertson
To: <frac-review@gov.ns.ca>, <premier@gov.ns.ca>, <MIN_ENV@gov.ns.ca>, <ENER...
Date: 5/30/2011 7:27 PM
Subject: hydraulic fracturing in Nova Scotia

I am writing to you because I am deeply concerned by the possibility that more hydraulic fracturing will be allowed in this province. The reports from the United States and from France have been most alarming. The cases that are going to court (against various fracking companies) are indicative of the damage that has been done in the U.S. and in Alberta.

There appears to be very little benefit to the economy of Nova Scotia and a gross threat to our precious environment, particularly our fresh water system.

I do not want my two year old grandson to suffer the consequences of a short-sighted proposal for minimum benefit to Nova Scotians and for major profits for the corporations wanting to undertake the production of gas through this dangerous method.

It has also been shown that the gas produced by fracking is in fact not a "clean" product and will not help us in any environmentally sound way to continue our greed for fuel.

I am begging you to stop all exploration and testing that has anything to do with hydraulic fracturing. My grandson is precious, as are all the children who are presently pre-schoolers; they will inherit a foul and uninhabitable world if we do not heed the warnings and stop this most destructive experiment.

Gerri Robertson
From: "N. S. Dept. of the Environment" <FRAC-REVIEW@gov.ns.ca>
Date: 5/30/2011 9:17 PM
Subject: Fracking.

Attention: Premier Darrell Dexter

I would like to express my disapproval of allowing "Fracking" in N.S.. I feel that there will be more destruction and harm to the soil and water surrounding the areas involved in fracking. Digging along our shorelines will lead to more erosion due to gaps in the land allowing sinking and washing away of our banks. We certainly do not need to put harmful chemicals in our oceans, we already pollute them with garbage, oil spills and other waste.

What about the destruction to the habitats of our birds and other wildlife depending on the shorelines and surrounding areas. Once we destroy the land and waterways we can't get them back.

Please consider all the facts involved and not just the big businesses which could care less about the area or people living in the places involved.

N.S. is a beautiful province – let's try to keep it that way.

Yours truly,

Carol Faulkenham
To whom it may concern; I am from Antigonish, N.S.

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments. The following are issues that need to be seriously considered when removing fuels from the substrate:

1. Effects on groundwater
2. Use and effects on surface water
3. Impacts on land, such as potential soil contamination
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids
6. Site restoration
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Doreen M. Smith
To Whom It May Concern:

Actually, this letter is addressed to all Nova Scotians; the threat of hydraulic fracturing concerns everyone here, as areas from the Annapolis Valley to Cape Breton are in the crosshairs. I will refrain from quoting figures and statistics, but after doing extensive reading on the subject, I have found nothing redeeming about fracking. Injecting millions of gallons of water, sand and toxic chemicals deep underground to fracture the earth and release natural gas can hardly be described as ‘clean’ (as the oil and gas lobby like to call it), and we have no control over where the gas goes once it is released. There is much evidence that fracking poisons our eco-system, our ground and well water, our air and our food supply. Nova Scotia is supposed to be the place where oil field workers and others can come back home and retire to, to escape that pollution elsewhere - why would we want to have that kind of environmental mess to clean up here? For a quick buck? That seems to be the only advantage to hydraulic fracturing that I can see - a fast dollar for oil and gas companies, and royalty revenues for the government (even though the royalties for the first year or two are at too low a rate - which is also when gas wells produce their highest yield). The plan is to sink literally hundreds of gas wells - hundreds of fracking sites - in the Windsor Block alone, let alone other sites in the province. The jobs associated with this will not be long-term, as wells do not require constant attention after the drilling is done, and their yield will drop dramatically after the first or second year of production. The environmental consequences will last for years.

Risks associated with fracking include the poisoning of cattle on farms near well sites, fish kills in salmon-spawning rivers, pollution of the Minas Basin and by extension, the Bay of Fundy (you know, that thing we’re trying to promote as a natural wonder of the world). Also, if we do not learn from the sad experiences of others already affected by fracking, we will start having cases of flammable tapwater, or families needing their water trucked in because their wells are toxic, not to mention the smog arising from condensate tank emissions. Also, what of the ‘produced water’ retrieved from a well? Where will this toxic brew ultimately wind up? That is, the remaining water that isn’t allowed to evaporate from the holding ponds into the air we breathe. How will this wastewater be treated? Where will it be dumped? What about high uranium and arsenic content in our soil and rocks? This will be dredged up too. Who gets handed the bill for the environmental cleanup at the end of it, when the wells are closed down and the oil and gas companies are out? Taxpayers, that’s who - the very same people who are forced to bear all the health and environmental effects resulting from this poisonous misadventure.

Another thing to consider is the geological instability that might accompany extensive fracking. Arkansas had to stop fracking in places due to earthquake swarms that were linked to a number of drilling sites there. Will this actually create cracked foundations in houses near fracking sites? If Horton Bluff is on the fracking agenda, what will that do to known fossil sites? What about the natural beauty of our landscape? Marred forever, for little gain.

I understand the need for jobs, especially in Hants County where Fundy Gypsum has closed. However, should we sacrifice the health of our population and environment for the sake of a relatively small number of short-term jobs? We enjoy a good quality of life here, even though many of us live paycheque to paycheque now. I will gladly continue living paycheque to paycheque if it means our province will not be
exploited, used and abused by greedy oil and gas companies. We should be focusing on filling the coffers in more imaginative, visionary ways - eco-tourism, (truly) green energy, and such. I certainly do not have all the answers to our provincial economic woes, but I am sure that fracking is not a good answer at all. There are far too many risks, far too few who will benefit, and far too many who will suffer.

Sincerely,
Don Crowell
From: <frac-review@gov.ns.ca>
To: 5/31/2011 10:54 AM
Date: review on hydro fracking
Subject:

Fracking does exist in NS - too early to relax

In April 20th, 2011, Light’s issue Karen Casey "takes the opportunity, to provide you with information" on fracking-

It sounds like everything is o.k. - But careful, we need to be aware that fracking is in the plans for NS and that there is an important deadline on June 6, when the government will review to grant "exploration rights" to companies that will lay the ground for fracking in the near future.

It is important to understand the exact wording of what has been said – because, if I may say, a twist is used - to relax public concern?

Ms. Casey quotes Energy Minister Charlie Parker, who states on March 17, "we do not have an application to use hydraulic fracturing in the province, nor do we anticipate one."

That is true and not true. The province had invited bids for "blocks" (of land) to be explored regarding their future exploration potential.

The deadline for companies to put in bids "on blocks for exploration" was not on March 15, as Ms. Casey states, but on March 22, 5p.m.

So of course, on the 17th, the opportunity for submissions (not for fracking but for exploration, that will include and lead to fracking) to the province was still open - the quote is irrelevant and misleading -

The government did receive two bids on "blocks for exploration" on March 22, just before 5p.m.

The two bids that the government received and anticipated - true - are not yet for the actual shale gas extraction by hydraulic fracturing but for "exploration rights only" - yet:

These explorations, will most likely include fracking and lead to fracking in the future - despite the fact that the staff of the Energy Department states (according to Ms Casey): "that this process is for exclusive exploration rights and does not include actual activities like seismic and hydraulic fracturing. It simply means no other company can come into that parcel of land to explore."

This is simply not true.

Exploration drillings have been carried out before in the province and hydro fracking was explicitly used, as can be read about in the respective Company’s report submitted to the Energy Department in 2008:

Page 10: Elmworth Energy Corporation/Triangle Petroleum Corporation
fracked in Noel in Sept. 2007

("Development Plan Application for Oil & Natural Gas Development Project, Windsor Block. Exploration Agreement 99-09-15-02, June 2008")

Triangle fracked several wells in Kennecook in December 2008 and May-June 2009


So exploration rights do include actual activities, such as fracking, because they simply have before - and the respective companies that explored then, now evaluate their data. I think we can assume that they hope, that what they find will be worth their fracking while and invested money.

Everybody in the industry knows, that

...90% of the shale gas exploration these days is done by hydraulic fracturing...

So, if fracking were not in the cards for the oil and gas companies in NS, why would they want to spend their money on exploring on shore shale gas opportunities - which will only come with fracking?

As we read in Triangle's "Stock Message Board" to investors about hydro fracking in NS:

"The Nova Scotia Advantage:

- 474,625 gross acres of land
- Favorable regulatory regime
- Reasonable royalty rates (10%)
- Proximity to Maritimes & Northeast Pipeline
- Premium gas pricing"


So NS is available and cheap. Once again.

Sure, before they actually start fracking (after exploration) in a commercial way, they must apply for a permit.

Do you find it realistic that a government that has invited applications for exploration will the***n, once something is found, not grant the job? That would be embarrassing. The companies have been invited to explore and then they will be let down? Just because meanwhile "a few concerned citizens worry about their water"?

One can actually read in Triangle papers, that THE GAS IS NOT ONLY FOR THE NOVA SCOTIAN MARKET - but rather for export. DID YOU KNOW That? Do we understand what that means?

The government does not offer any clarification on this apparent fact at all. Is it true, that this gas is mostly for export, Ms Casey?
Why do you want Nova Scotians to think, that their shale gas is a
a) clean energy
b) for Nova Scotians
c) that will give Nova Scotians jobs and
d) relief of environmental damage (of coal mining?).

I think, we can say: Fact is, fracking is neither clean, nor does it
produce jobs, nor does it reduce environmental damage (obviously quite the
opposite is true), nor is it for Nova Scotians!

It is certainly long overdue to be concerned about the coal we are burning
in Nova Scotia - that is right - and the best idea we have, is to add on
more environmental destruction of what is left - for gas, that doesn’t
even get burned, in the volume extracted, in Nova Scotia - fracking just
for royalties, cheap royalties. Is our home province worth so little to
us?

By-the-way: "Shale gas, produced by hydraulic fracturing could create as
much as twice the greenhouse gasses as coal", according to a study soon to
be published by Cornell University professors - are we doing our homework?

y/)

Water. We humans are dependant on water. It is a fact, that the recovery
of the highly toxic water abused by fracking is not recyclable. And by the
way, the well N-14-A in Kennetcook in 2008 recovered 15% of the
fluids...that means that 85% of the fluids are lost in the ground. which
is not unusual, but rather common ...all waterways are connected as we
know... but never mind, it is totally safe. All we need are regulations.

And fracking destroys jobs. Certainly the tourist industry will lose jobs
(and the tourists). The farmers and fishers will be
Redundant in many areas. Elmworth reports that it will need about 15
people to manage 300 wells. And 100 people to construct each site - low
quality, short-term jobs. Once again.

Why was the wind generator park in Nuttby built by a German company and
why did they have to fly in their engineers? Why did the NS Government
missed out years ago in building this industry themselves, with Nova
Scotians, for Nova Scotians... these would have been long term, high
quality jobs. Are we missing out again now, still emphasizing oil and gas?

Mr. Parker says, we have the world most aggressive targets in sustainable
energy development. It is quite easy to have an impressive target and
website. But what does the province actually DO? Why do we simply believe
Mr. Parker that we need on shore gas drilling to get to our “aggressive”
targets sometime in the future. Mr. Parker states, that we cannot afford
to be independent from oil and gas “in this life time anymore” - other
countries seem to be able to put more concern in this lifetime. For parts
of Germany a ban on fracking exists and the immediate exit from Nuclear
power is discussed as absolutely possible.

Why do we, the public, still don’t know, which companies have put in the
bids - and exactly for what.

The government has up to 90 days (from March 22 on - to June 22) to grant the job - and here we are, waiting, being pacified by making us believe, nothing is happening, and that that "nothing" is totally safe, just as safe as Nuclear Power always has been, too, I assume.

I demand genuine clarification on exactly what is going on and no lobby talk. I am insulted by the attempt to be turned into a fool again.

Who is this gas for and why do you think you can control fracking, where it has proven itself absolutely uncontrollable almost everywhere else. In matters like this, there is no safety other than not doing it. Let us not be greedy. Fracking leads neither to prosperity for the people nor to progress in any way. It is dangerous and heart breaking. Let us write letters to our elective representatives to let them know, that they cannot sell us like that and that their "reviewing" of the whole process is just a facade to fool us. Or have you been invited to a public, genuine discussion on the matter?

Gerlinde Pilgrimm.
Dear Team of Senior Technical and Policy Staff,

My name is Ashley Sprague and I am resident of . I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

I am concerned about the impacts fracking will potentially have on local groundwater supply. As Nova Scotians, we value our clean drinking water and do not want to see this invaluable resource put at risk. The short term gains of fracking could potentially have long term, irreversible impacts on human and ecosystem health. I feel that until we understand more about these potential threats, fracking should not be allowed to take place in our province. There is absolutely no need to speed this process through. Let’s take the time to do a thorough evaluation of the risks and hear from the people of Nova Scotia in a meaningful public consultation process.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Sincerely,

Ashley Sprague
From: "Brennan Vogel" <energy@ecologyaction.ca>
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 1:29 PM
Subject: EAC Energy Coordinator: Fracking Concerns

May 31, 2011

To Whom It May Concern:

My name is Brennan Vogel, I am the Climate Change and Energy Coordinator at the Ecology Action Centre. I am writing to submit comments with regards to the provincial review of hydraulic fracturing (‘fracking’) currently underway. While I am encouraged that the province has created an opportunity for public comment on this controversial issue, I wish to underscore a few key points of concern for your consideration at this time, with the aspiration that the relevant provincial policy-makers and decision-makers will be responsive to legitimate and widespread public concerns on this serious issue.

The development of onshore oil and gas industries in efforts to replicate or replace the untimely exhaustion of off-shore oil and gas resources should not be the basis for supporting controversial and harmful extraction methods such as ‘fracking’ in Nova Scotia. The lesson of the off-shore should be clear: an export-based development model of oil and gas resources was unsustainable for the provincial economy, energy transformation and environment. If ‘fracking’ and continued natural gas extraction for export is seen as a potential substitute to contribute to diminishing provincial oil and gas revenues, this is clearly short-sighted and not in the best interests of Nova Scotians or the Nova Scotian environment.

Furthermore, if ‘fracking’ is seen as a substitute for off-shore, the province is losing out or missing the directives of the province’s 2020 vision that highlighted in the Environment and Sustainable Prosperity Act (2007). This Act was unanimously passed by all parties in an consensual effort to transform Nova Scotia into a ‘clean, green’ and ‘sustainably prosperous’ economy over the next 9 years, while also reducing unsustainable fossil fuel dependency and greenhouse gases from electricity production, heating and so on.

EAC recognizes that the development of low-carbon and transformative energy strategies must include consideration of natural gas as a source for transforming heating and electricity production fuel supplies. There are lower impact and proven methods of producing natural gas (methane) from agricultural residues, municipal sewage and waste and other processes. The development and inclusion of comprehensive Feed-In Tariffs and energy strategies to reduce highly volatile and climate
changing greenhouse gases from our agricultural and municipal wastes should be a greater provincial policy priority than ‘fracking’ green fields. Ultimately, these alternative types of procuring lower-impact natural gas supplies from existing wastes are required in an effort to reduce provincial greenhouse gases 10% below 1990 levels by 2020. Thus far, Nova Scotia is not on track to meet this provincial goal. ‘Fracking’ further introduces already terrestrially contained methane into our atmosphere, further precipitating the specter of catastrophic interference with the global climate. Clearly, this is unacceptable.

Furthermore, the negligible utilization of natural gas in Nova Scotian homes, industries and electricity production (Tufts Cove, the only natural gas turbine, is set to close in 2020, while coal burning still continues) highlights not only the lost opportunity of exhausting a 200 year supply of off-shore natural gas in decades with little benefit to Nova Scotians, but further highlights the urgent need for transformative changes to the ways we produce or import low-carbon electricity and heating fuels (hydro, natural gas) from other provinces or through the domestic, low-impact ‘waste-recovery’ methods mentioned above.

Clearly the environmental and human impacts associated with ‘fracking’ should warrant appropriate and stringent provincial regulatory oversight, if not an outright moratorium or ban effective immediately. The experience of many communities in the United States has shown that ‘fracking’ has negative effects on groundwater, the use of and effects on surface water, as well as impacts on land, such as potential soil contamination, as well as issues with waste management, including surface ponds of produced waters, and further difficulties with the identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids (due to proprietary restrictions and corporate secrecy). There are other issues with site restoration as well as a need to ensure that operators are required to have the necessary financial security or insurance prior to conducting activity in the province to compensate for, if and when, the ‘fracking’ goes wrong and there is a need for compensation. Surely this is the bare minimum that is required, should the province choose to proceed with a regulatory model for allowing ‘fracking’ in Nova Scotia. However, given that the price of Nova Scotian’s health and the integrity of Nova Scotia’s already fractious ecosystems hangs in the balance, the EAC advocates that fracking in Nova Scotia is short-sighted, not in alignment with a vision for sustainability while presenting un-necessary and unbalanced risks to our province’s health and environment.

Brennan Vogel, BES MA
Energy/Climate Change Coordinator
Ecology Action Centre
Halifax, NS
B3K 4L3

E: energy@ecologyaction.ca

T: (902) 442-0199

F: 902-405-3716

<http://www.ecologyaction.ca/content/become-member>
From: "Sylvie Boisvert
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 1:30 PM
Subject: Stop fracking please!

Good afternoon,

We leave in Quebec and have bought a secondary house in Nova Scotia because of the fresh air...

We are thinking about selling it, since we have heard that you are fracking Shale Gas. Please, don’t let this destroy the beauty of Nova Scotia. Money don’t buy everything.

Thank you for you attention.

Sylvie Boisvert
South Shore Naturalists Club  
c/o DesBrisay Museum  
60 Pleasant Street  
Bridgewater, N.S.  
B4V 3X9

May 30, 2011

Hydraulic Fracturing Study  
Environmental Science and Program Management Division  
Department of the Environment,  
P.O. Box 442  
Halifax, N.S.  
B3J 2P8

Thank you for the opportunity to submit comments and concerns regarding the review of potential hydraulic fracturing (fracking) operations in Nova Scotia. Led by industry, shale gas is being promoted as the way of the future as a clean energy source which would break dependence on existing oil suppliers. However, there is now sufficient evidence to refute many of industry's claims, both on the side of energy efficiency and total greenhouse gas emissions from shale operations, and more significantly on the dangers to the environment, in particular to water resources.

Our comments will follow the topics outlined in the scope of this review:

Groundwater:
The Provincial document "Water for Life" - the basis for a full Water Resources Strategy - places great emphasis on protecting the quality and quantity of water resources in Nova Scotia for the benefit of future generations. Understanding the quality and quantity of existing resources is recognized as an essential component, and the document includes a commitment to assessing surface water and groundwater resources in watersheds. The target is to produce a watershed map by summer 2011.

Without a full and comprehensive watershed map, including groundwater mapping, there can be no understanding of potential impacts from shale gas fracking operations.

Under existing provincial regulations approvals are required for groundwater withdrawals of over 23,000 litres a day. To obtain this, a hydrogeological study must be completed covering the sustainability of the aquifer, well interference effects, water quality effects, potential for seawater intrusion and groundwater surface water interactions. The priority in any decision on groundwater withdrawals is on drinking water. Concern for the impacts of fracking on water supplies is well documented in the following: Fracture Lines: Will Canada's Water be Protected in the Rush to Develop Shale Gas? By Ben Parfitt, for the Program on Water Issues, Munk School of Global Affairs, University of Toronto, September 15, 2010.

Surface Water:
There is a hydraulic connection between surface and ground water. Surface water use and effects cannot be assessed in isolation from groundwater.
From industry data, water for fracking can be drawn from many sources including groundwater, surface water (lakes, rivers and streams), municipal or industrial waste water, or re-use of water recovered from fracking operations. Fracturing of shale rocks has the potential to release contaminants such as uranium and arsenic. Comparing the boundaries of the Maritime Shale Basin with provincial maps of naturally occurring uranium and arsenic raises some concern. Fracturing opens up fissures in rock ("non-linear chaos") potentially allowing contaminants to migrate into fresh water (Cornell Fracture Group Report). A sound understanding of the geology of the area is essential prior to any gas well drilling.

Added to these potential contaminants are the additives used in the fracking operation, as well as from waste water, which will be addressed later.

The quantity of water required to frack a well can be as high as 8 million gallons and a well can be fracked up to 18 times. Some of the water returns to the surface with the gas, the rest remains underground. The potential for leakages is high at many stages of the operation. The cement casings in wells have been defective allowing contaminated water to escape, a recent blowout at a well in Pennsylvania resulted in leakage into adjacent waterways (Reuters, April 21, 2011). methane has been found in drinking water wells (Duke University research) to name just a few recent cases.

**Impacts on land:**
In addition to possible contamination from leakage or waste water, any shale gas development involves large infrastructure projects such as roads for heavy equipment access and for trucking away waste water, the building of waste water ponds and gas processing plants. The environmental impacts of these cannot be underestimated.

**Waste Management:**
The industry must provide full disclosure of the contaminants in the fracking waste so that the Province can develop comprehensive and rigorous hazardous waste regulations to deal with them. This is critical to protect water supplies and local communities when transporting fracking wastes to industrial waste disposal sites, such as in Debert, Nova Scotia, and to guide the treatment of the fracking wastes. This wastewater, which may have elements of total dissolved solids, hydrocarbons, heavy metals and radionuclides (Hazen and Sawyer. 2009. Impact assessment of natural gas production in the New York City water supply watershed. New York, New York City, Department of Environmental Protection), must be stored on site, transported from the site, treated to reduce toxicity, and properly disposed of. Risks of contamination exist throughout this chain of activities. The fracking fluid which is not recovered stays underground, with little or no understanding of the long term impact of these chemicals on the environment.

Chemicals stored at the site pose a threat if leaks occur from tailings ponds or tanks, or if the fracking fluid dissipates into the atmosphere, or if workers are exposed to them.

A dramatic increase in wastewater from future well pads raises questions as to whether or not existing disposal sites will be able to accommodate the quantities, or alternative sites or methods will be needed. Recycling of fracking wastewater can help to reduce the volume of wastewater generated, but residuals remain to be disposed of.

**Management of Additives:**
The industry has historically been extremely reluctant to provide information on the additives used in the fracking process. Several hundred different chemicals may be involved including benzene, toluene, boric acid, xylene, methanol, formaldehyde, ammonium bisulphite. Although the use of diesel was
supposedly banned in the US 7 years ago, fracking companies are still injecting thousands of gallons into their wells (NY Times, January 31, 2011). These chemicals have human health effects including damage to sensory organs, respiratory systems, gastrointestinal systems, nervous systems, immune and cardiovascular systems. Why would we allow these contaminants to be injected into underground fissures, leaking into the water all living things need?

Standard possibilities for baseline water testing available to homeowners in Nova Scotia from the Environmental Services Lab at the QEII in Halifax, include microbiological counts (e.coli, staphylococcus, etc.), turbidity, minerals and elements such as lead, arsenic and uranium, not chemicals. Costs for existing detailed water analyses range from $79 to over $200 and would detect only the disturbance of already existing elements. There is no way to estimate what costs might be attached to testing for the known additives or if local facilities have the capability to perform the tests.

Responsibility and requirements for water testing prior to fracking operations or test well drilling have not been established in many other jurisdictions, leaving subsequent groundwater or surface water contamination problems in a murky legal zone when problems develop. Not all of the known chemical additives in the process advertise their presence through colour, taste or smell. Baseline test results on water quality for a wide geographic area prior to any fracking activity should be mandatory and the results publicly available to protect the drinking water we all use.

Site Restoration:
Of course, ideally, sites should be restored by removing contaminants and restoring biodiversity. The damage done to the Nova Scotia landscape and environment through building the infrastructure necessary to carry out hydraulic fracturing will be long-term. It is impossible to restore native biodiversity or agricultural soil quality to roads built for heavy trucks, to sites cleared for drill pads, to wastewater pits, to ground where contaminants have spilled accidentally.

Financial Security and Insurance:
This is an extremely complex aspect of shale gas fracking, however, a lawsuit has now been launched in Alberta against Encana which will allow a Canadian perspective.

The Government of Nova Scotia has a responsibility to protect its citizens from harm, and not to expose taxpayers to unnecessary expense. Individual homeowners should not have to bear the cost of extensive well testing prior to gas operations, nor to ongoing tests during and after fracking. Clear lines of responsibility must be established between drilling, fracking, and energy companies with regard to testing and liability.

Taxpayer liability could extend many years into the future as contamination may not be evident until long after fracking operations have ceased. The Auditor General's Report in Quebec pointed to deficiencies in this area, stating that civil liability insurance regulations are not stringent enough and that taxpayers could ultimately bear clean-up costs. In Quebec 19 out of the current 31 wells have experienced leaks.

Investment and insurance companies are beginning to show concern, and shareholder resolutions have already been presented to nine oil and gas companies asking for disclosure of risks from fracking.

Closing remarks:
The scope of this review fails to address some very significant points, including the fact that this energy source is neither clean nor efficient. While burning creates less CO2 than coal, the methane released by fracking is a more potent greenhouse gas. Industry data also omit the significant impacts from transport and processing. The energy return on energy invested ratio is poor at 2 joules to 1 compared to 15 to 1 with conventional oil and gas generation. Air pollution from fracking operations is often overlooked but research has shown that gas field ozone can extend for a 200 mile radius and impacts both human health and the health of conifers and some agricultural crops.

We urge the government of Nova Scotia to heed the cautionary approaches being taken in other jurisdictions such as the halt or potential bans on fracking in Quebec, France, South Africa and some US cities. The gas will still be a resource for the future when improvements in technology could indeed make this a clean energy. In the meantime emphasis needs to remain on proven green energy projects in the province.

Our vision for Nova Scotia is a province with clean water, healthy forests, vibrant communities and a healthy population. Fracking for gas has the potential to destroy this vision.

Respectfully submitted
South Shore Naturalists
From: Garnet Roze
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 3:43 PM
Subject: Fracking

Please stop the testing. Let's get this right... have a proven method for fracking before rushing forward.

Garnet Roze
From: "Bob MacDonald"
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 4:27 PM
Subject: Comments regarding the present frac-review
Attachments: Understanding Frac Fluid.pdf

SUBMISSION OF COMMENTS TO THE REVIEW OF HYDRAULIC FRACTURING FOR SHALE GAS IN NOVA SCOTIA

I am a native Nova Scotian and graduated from Dalhousie University with a science degree in Geology in and also graduated with a degree in Environmental Planning from the Nova Scotia College of Art and Design in . I worked in the Western Canada oil patch in the mid 1970s as a petroleum geologist, in Nova Scotia as a water resource geologist with the Nova Scotia Department of the Environment in the late 1970s and in the Atlantic Canada onshore and offshore oil and gas and natural resource industry for over 35 years as a professional geologist. I have mapped, explored for water resources across most of the Province; mapped, drilled and explored for coal bed methane resources in most of the coalfields of Nova Scotia; worked as a geologist on offshore drilling rigs near Sable Island and Labrador in the 1980s, worked as a geologist with the Nova Scotia Department of Natural Resources for 10 years; explored for and developed industrial mineral properties and gold properties with private and public companies in Nova Scotia by following all the enacted government regulations. I worked on all the major natural gas pipeline projects in Nova Scotia and New Brunswick since 1996 again abiding with all the very strict regulatory requirements of the National Energy Board Act, other Federal regulatory agencies, all Provincial regulatory agencies in both provinces. I have participated in fracking programs in Pictou County in the early 1980s using both water and nitrogen as the propellant agent. I was present at a recent frac in Springhill in 2006 as a geologist and director of a public company.

I apologize for the long personal professional history above but I thought it important to provide my background experience working in the natural resource industry in Nova Scotia and New Brunswick most of my professional career to illustrate that the developing of natural resources for the economic benefit of all Nova Scotians can be accomplished in a safe and environmentally friendly way. I do not consider myself a "fracing expert", but I have been involved in the Provincial natural resource exploration and development industry long enough to witness that development of natural resources can be done in a safe and environmentally responsible manner following the regulations that are in place both on the Federal and Provincial regulatory level. The recent controversy over the fracking issue appears to stem from the documentary "Gasland" that is full of misinformation about the petroleum industry and misleading in its representation of facts. It tends to sensationalize the lack of or failure to abide by existing regulations in the States involved. Nevertheless is accepted as gospel by individuals who are not willing to have dialogue about the issue. This is why Nova Scotia needs strict regulations with regards to hydraulic fracturing for shale gas that must be followed and enforced.

I support the Province of Nova Scotia's decision to undertake this review of Hydraulic Fracturing for Shale Gas in Nova Scotia at this time. Hydraulic Fracturing has been conducted safely and successfully in the petroleum industry for over 60 years and ironically it has been used for many more years in the water well drilling industry. Hydraulic fracturing technologies have improved immensely since these early days and will continue to improve as more research and development will result in more effective, more efficient and more environmentally friendly techniques. For example, the large amounts of water that are required as a propellant for a typical slick water frac can be replaced with other propellants such as nitrogen, carbon dioxide and propane. Nitrogen has been used for many years, but more recent research has resulted in propane and carbon dioxide being used as the propellant in recent frac programs. The use of these gases has reduced or eliminated the need for chemical additives to the propellant. When talking about the "chemical additives" to the frac water used in slick water frac, this involves 5-6 additives (not 500+) and most are common to every day life and make up less than 0.1% of the water propellant mixture. The additives protect the wellbore from corrosion and improve the effectiveness of the fracture stimulation. I've attached a one-pager that describes the typical frac fluid additives proposed to be used by SWN Resources Canada Inc and is available to the public at the company's Open Houses in New Brunswick. These are typical additives to frac fluids and full disclosure of all additives need to form part of all hydraulic
fracturing applications in Nova Scotia.

Good clean water and the protection of this valued provincial natural resource is of great concern to all present and future residents of Nova Scotia. All companies presently conducting or planning to do exploration and development work for shale gas (as well as all other types of work) must abide by all Federal and Provincial regulations to ensure that the water resources of Nova Scotia are protected. This is why this present review is essential to ensure the proper regulations are in place and total compliance of these regulations are enforced.

Having the applicable regulations in place, monitoring compliance and enforcement are all essential components to a successful shale gas industry in Nova Scotia. The mandate in place for this present review covers all that is necessary for the complete review of the existing regulations and reviews of other jurisdictions across Canada and in the United States. The resulting set of recommendations to improve current provincial regulations will be submitted to the Government of Nova Scotia for further review and further public comment. Then the revised regulations will be enacted and compliance will form part of the application to conduct hydraulic fracturing for shale gas in Nova Scotia.

Thank you for the opportunity to submit my comments at this stage of the review. Proper regulations that are workable, enforceable and orientated to the safe development of the rich natural resources of Nova Scotia will provide future environmental protection, water resource protection, local employment opportunities, tax and royalty revenue and a better quality of life for all Nova Scotians.

Respectively submitted,

Robert MacDonald, P.Geo.
May 31, 2011
Understanding Frac Fluid

Additives protect the wellbore from corrosion and improve the effectiveness of the fracture stimulation.

<table>
<thead>
<tr>
<th>Additive</th>
<th>Purpose</th>
<th>Common Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicocide (glutaraldehyde)</td>
<td>Eliminates bacteria in the water that can produce corrosive by-products</td>
<td>Desinfectant; Sterilizer for medical and dental equipment</td>
</tr>
<tr>
<td>Corrosion inhibitor (Ni, n-diethyl hemimaleate)</td>
<td>Prevents the corrosion of the pipe</td>
<td>Used in pharmaceutical; non-ionic fibers and plastics</td>
</tr>
<tr>
<td>Friction reducer (polyacrylamide)</td>
<td>Minimizes friction between fluid and pipe as required</td>
<td>Water treatment, soil conditioner</td>
</tr>
<tr>
<td>Citric acid</td>
<td>Prevents precipitation of metal oxides</td>
<td>Food additive; Food and beverages; Lemon flavor</td>
</tr>
<tr>
<td>Scale inhibitor (ethylene glycol)</td>
<td>Prevents scale deposits in the pipe; not always required</td>
<td>Automotive antifreeze, household cleaners, drinking, and cables</td>
</tr>
<tr>
<td>Sand</td>
<td>Above the mixture to remain open so the plug can collapse</td>
<td>Drinking water filtration, play sand</td>
</tr>
</tbody>
</table>

SWN Resources Canada, Inc., is a wholly owned subsidiary of Southwestern Energy Company (NYSE:SWN).
From: chris benjamin
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 4:54 PM
Subject: Fracking comments

Dear Team of Senior Technical and Policy Staff,

I'm writing with great concern about "fracking."

I grew up in and was blessed with access to numerous beautiful lakes, most of which were clean enough to swim in. At that time we drank well water from a dug well. As far as I know, it too was clean. But such things, which I consider human rights, seem to be threatened these days by an unrelenting assault of chemical release. The last thing we need is the release of more chemicals into our already abused ecosystems and, specifically, waterways.

In its recent report, "Chemicals Used in Hydraulic Fracturing" the US House of Representatives reports that: "between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products...some were extremely toxic, such as benzene and lead. The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of compounds containing the chemical, was methanol. Methanol, which was used in 342 hydraulic fracturing products, is a hazardous air pollutant and is on the candidate list for potential regulation under the Safe Drinking Water Act. Some of the other most widely used chemicals were isopropyl alcohol (used in 274 products), 2-butoxyethanol (used in 126 products), and ethylene glycol (used in 119 products). Between 2005 and 2009, the oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act...In many instances, the oil and gas service companies were unable to provide the Committee with a complete chemical makeup of the hydraulic fracturing fluids they used...In these cases, the companies are injecting fluids containing chemicals that they themselves cannot identify."

Frankly, that's all you need to know about this procedure. Even the fracking companies can't identify what they're doing to the environment and human beings. This is a massive risk to public health and the environment without accountability. It is the duty of our governments to do anything they can to disallow this blatant disregard for people and the environment in Nova Scotia. Fracking is a real threat to clean, safe, healthy water. I recommend a moratorium on it while industry meet its responsibility under the precautionary principle, and funds independent reviews of fracking. If those reviews show it to be unsafe—if industry cannot prove this process to be 100 percent safe beyond a shadow of a doubt—it should be banned completely and permanently.

Sincerely,

Chris Benjamin
From: Julia Feltham  
To: <frac-review@gov.ns.ca>  
Date: 5/31/2011 5:44 PM  
Subject: Fracking in Nova Scotia

Hello there,
I recently went on a video journalism tour of Nova Scotia, and heard quite a bit of concern about Fracking. Most of this concern had to do with water quality, caustic acids and a general sentiment of short-sightedness in regards to Hydraulic Fracking. Here is one of the many-http://youtu.be/2DfbrXeB7A>video clips concerning fracking on-shore oil & gas infrastructure I collected. The prompting questions I asked when collecting these anecdotes were "What do you love or know about this place?" "What are your worries?" "What are your hopes?"

In the best interest of Nova Scotians, and our current identity-- I care to voice my opinion against fracking here. I believe it is important to guage the environmental impact thoroughly, and not rush in any way this project.

Beyond environmental concerns, I am concerned for what this project means to our Nova Scotian identity. I think it is important for us to know we are progressing, and making obvious steps stewarding a future we care to share. I am certainly not anti-development myself, and I think natural gas is in many ways superior to the Venezuelan coal we burn with often in Nova Scotia and other fossil fuels we consume. But, in all my travels, I found Nova Scotians (especially rural Nova Scotians) believe we are simply managing problems and thwarting the inevitable and slow demise of rural areas and the environment. Certainly, job creation is wonderful, and I heard many complaints about Nova Scotians leaving to work in oil fields 'out west' but people feel somewhat hopeless, small, forgotten, abandoned and isolated. In employing Nova Scotians in fracking endeavors, you will not be assisting these troubles. Hiring people to do things that are injure our environment or that are similar to what makes us often look upon "out west' with disdain-- We see on-shore oil and gas endeavors as short-sighted, and short-lived and injurious to our own values in the present. If we are to extract natural gas on shore I believe we should employ a Nova Scotian think tank to do it in the best and most sustainable way it has ever been done, and let all the profits be managed and multiply here: In Nova Scotia.

Nova Scotians need to recognize themselves as problem solvers, not problem managers. We have every chance in the world to be the an exemplar here, and begin stepping away from band-aid employment. If we care to follow through on our aims ("Nova Scotia* aims to have one of the cleanest and most * sustainable* environments in the world by *2020*") and help people to own and remedy our troubles, we need jobs and economic stimulants that are in line with our shared values and not seen as hypocritical to our long term goals (Including our 2020 committments to protect ecosystems, manage air emissions, water quality, renewable energy etc). Yes, generating wealth is important to Nova Scotians, talent retention and keeping our youth here is important to Nova Scotians-- But our jobs should be entrepreneurial, innovative and in line with our logic. Our Health and our environment needs to be seen as paramount, especially in the creation of new jobs. New jobs are where Nova Scotians envision their future and their family's future here, and take ownership and action in their own communities. We are certainly not a 'have not' province, though many Nova Scotians believe this.
The efforts of our government should not reflect efforts of those who are economically desperate, but of those who are committed to doing something different, something innovative, something community oriented. Something patently Nova Scotian.
We deserve to know we are different and can do better, and that is why I would care for there to be no fracking in Nova Scotia.

Thanks for your time, and I wish you well
Julia M. Feltham
From: Anne Levesque
To: <frac-review@gov.ns.ca>
Date: 5/31/2011 8:31 PM
Subject: Hydraulic Fracturing Review

Dear Team of Senior Technical and Policy Staff,

I live in Strathlone, Nova Scotia. Lake Ainslie. Here are some thoughts regarding the review of hydraulic fracturing in Nova Scotia.

I don't want a "review" of hydraulic fracturing in Nova Scotia, I want a "ban".

What "should" be reviewed is the fact that the Department of Energy acts as both the promoter and the regulator of the oil and gas industry, creating a conflict of interest. The role of regulator should go to another department.

We can (and will one day have to) live without oil. We can't live without water.

Anne Lévesque
From: Sara Lipson
To: <frac-review@gov.ns.ca>
CC: 
Date: 5/31/2011 8:51 PM
Subject: hydraulic fracturing review - comments

Dear Team of Senior Technical and Policy Staff,

I am writing to you in order to submit my comments regarding the review of hydraulic fracturing. I moved to Nova Scotia a few years ago and have fallen in love with the lakes and rivers all around me. In addition, I understand our relationship to and reliance on surface water and groundwater for drinking.

I am concerned about potential negative effects of hydraulic fracturing on soil, air, and water quality. I believe that fracking, as it is currently practiced in North America, is not a benign process; therefore, I would like the Nova Scotia government to carefully regulate fracking, perhaps banning it altogether.

Thank you for your consideration.

Sincerely,

Sara Lipson
To the reviewers –

Hydraulic fracturing (fracking) is a complex issue that extends far beyond a mere technology. It may directly affect our ground and well-water, of course, but also will likely affect our air, soil, roads, bridges, economy, health, tourism, property values, and overall quality of life.

The Province's review, as currently structured, neglects a great many of these possible outcomes. I encourage a full strategic assessment of "all" of the potential impacts not merely of a specific technology, but of inviting an industry to Nova Scotia that has repeatedly demonstrated utter carelessness with local interests and environmental concerns.

The gas companies themselves, who stand to profit handsomely from extracting our gas by fracturing the shale deep beneath our soil, would be gone in a decade or two, leaving behind a shattered landscape, fractured ecosystems, damaged roads, and precious little else of value to Nova Scotia. This is not considered in the review.

They promise royalties, but of what kind? Strangely, according to the gas companies themselves, wells drilled would receive a two-year royalty holiday from Nova Scotia. Since they anticipate extracting 50% of a well's gas in the first year, and 25% in the second, Nova Scotia is left with a small percentage of a small percentage, at best. Most of the profits go out of province, as will the gas itself.

They promise jobs, but of what kind? Most of the high-paying jobs will be fly-in, fly-out visiting experts and managers; the rest are the low-quality
jobs working within the toxic fumes of the fracking process -- leaving any potential health impacts to the Province.

Fracking is fraught with potential for calamity, and if the full costs of allowing gas companies to dominate our landscape for a decade or two are considered, it is almost certain to cost Nova Scotia far more than we gain from paltry royalties.

Few of those costs are considered in the current review.

Every day, it seems there's a new story about a new study discovering the long-term damage of fracking. One day's it's the "discovery" of radiation in the returned fracking fluids; the next day it's the full-lifecycle carbon costs being much higher than touted; the next it's the LA-level air quality of Pinedale, Wyoming, a formerly pristine region; the next it's that the cost to Arkansas for fracking-related road upkeep far exceeded the royalties the state received from the drillers.

Nova Scotia should be in no hurry to frack, until all the facts are in. The Precautionary Principle, as contained in 2(b)(ii) of the Nova Scotia Environment Act, should be at the base of our decision-making. The scope of the review itself should allow for any "outcome, including an outright ban if it poses too great a risk of irreversible damage. The "scope" should not just lead to an outcome that considers "best practices" of other states or provinces. The stakes are too high.

Nova Scotia is a small, clean, lovely province. Those qualities are increasingly valuable, in our rapidly warming world. Nova Scotians have become increasingly wise in our use of our own resources, and unusually, can see rural areas (particularly in the North Shore) that have been slowly growing.

Any review of fracking should acknowledge all that is being risked, since Nova Scotia, as we know it, is at risk from this industry.

Way back before the gas industry moved into Wyoming, I marveled at the crisp fresh air of Pinedale. I'm deeply saddened to learn that now, because of the shale-gas drilling, Pinedale's ozone and smog levels are worse than Los Angeles on its worst days. I've driven through the gas fields of Oklahoma and Texas; I don't want to see our lovely province tarnish itself into them, in the pursuit of short-term dollars, and then become an industrialized boom-bust landscape, after the frackers leave.
Please look through the following categorized lists of potential impacts. Most are not addressed in the current “review” scope.

Not all of them are certain. But certainly, much of the below would come true, if shale gas drilling becomes part of Nova Scotia’s future.

We can do far better, to help the Province prepare for the next 10, 30, 100 years or more, than the short-term gold-rush economics of hydro-fracking.

*Soil/Farms/Fisheries*

- Toxins of many forms (heavy metals, radioactivity, toxic water, spills) could make any affected family farms worthless for resale, and their products suspect. No studies on long-term toxic impacts exist. This is not addressed by the current review process.

- Poisons could destroy the growth of organic- and local-food-movement farmers. Long-term economic effects such as this are not considered by the current review process...

- If toxics from fracking fluids become part of sewage-treatment sludge, they could compromise vast tracts of land (if the treated sludge is applied to soils) or complicate the handling of all resultant treated waste (landfill near watershed? Landfill near ocean?).

- Potential impacts on lobsters, clams, and other shellfish in near-ocean waters, as well as fish farms, and regional fisheries (if released toxins are ingested by phytoplankton and other base-of-food-chain organisms, and passed on to their predators)

- Endocrine (hormone) disruptors found in fracking fluids could affect farm animals, wild animals, and aquatic animals.

*Roads*

- Our roads were not designed for the stress of carrying 65-ton trucks hauling millions of gallons of water, chemicals, and tons of sand over them, all day and night long, day after day.
- Our coastal towns, with buildings on either side of the main highway, would become echo chambers as the trucks rumble through.
- Our bridges will be stressed from repeated overweight traffic.
- These costs would be substantial over the next 10-20 years.
- Many roads follow the shoreline; ecology would be disrupted by noise and pollution and risk of spills, and thrumming vibrations risk increasing coastal erosion.
- Road shoulders, with big trucks passing each other, would take a beating – already the case (in miniature) with cement trucks and timber trucks as they pass.
- According to extant data, it takes between 250-1200 65-ton 18-wheeler truck trips per well.

*Health*

- Multiple toxins, like hormone disruptors and carcinogens, could have long-term impact on spiraling health costs for the province;
- Health impacts of the above often occur 5-25 years out, long after the gas companies have disappeared;
- Increased stress generally, from massively increased traffic rumbling through towns, and an industrialized landscape, running 24 hours a day, 7 days a week, would have significant health effects;
- Radioactive material is frequently freed from the shale via fracking (see the Marcellus) – the long-term dangers of such material is be clear, though not considered in the review;
- Immediate physical and emotional impact from major disruption, uncertainty, fears of health effects, and loss of control over our local quality of life could have long-term consequences.
- Non-human animal health effects could be substantial: wildlife, farm animals, fish, deer, ducks, geese – they don’t read signs not to drink the water, land in the tailings ponds during migration, etc.
- Respiratory illnesses would increase across the province, as has been demonstrated elsewhere.
- Risks to Nova Scotia gas-rig workers are poorly understood (as far as I can tell, completely unstudied), and could have long-term impacts.
- Risks of low levels of poisons accumulating over time are substantial, and affect the very old and very young disproportionately.

*Tourism/Immigration*

- Tourism could be affected significantly, if our landscape is industrialized, our towns loud with truck traffic, our roads congested with fracking rigs, and overall, if we are asking tourists to tour an increasingly unattractive landscape.
- How often have we heard “Nova Scotia? It’s so beautiful there,” from our friends down South? We don’t want to hear “Nova Scotia? It was once so beautiful there.” Natural beauty is difficult to review, but should be somehow considered in the review.
- Can Nova Scotia be “Canada’s Ocean Playground” if our landscape has been degraded?
- I’m told that 2000 families have emigrated to Nova Scotia from UK over 5 years, most with means and abilities; that influx could evaporate
- Permanent loss of Nova Scotia’s “brand” for good stewardship of land, water, and sustainable development
- Vibrant rural development (the North Shore has been growing in population) may be halted, even reversed.
- Peace, quiet, and loveliness is what tourists want – if that image is tarnished, it will be exceedingly hard to recover.
*Air*

- Volatile Organic Compounds (VOCs: endocrine disruptors, carcinogens, toxins, etc.) are emitted as part of the drilling/fracking process, often intentionally, from "evaporation" ponds – these can have profound effects on air quality.
- Increased pollutants from truck traffic all day every day – diesel fumes, microparticles, and urban toxins that increase asthma and other respiratory problems.
- Well methane/gas leakage, which has been poorly studied, would likely damage air quality, and could have long-term atmospheric climate impacts.
- Worker exposure to concentrated toxins around fracking site causing long-term respiratory damage.
- Downwind problems (see Pinedale, Wyoming, and many other locales).
- Any extreme weather (hurricanes, flooding, torrential downpours) could spread poisons in unexpected ways – sprays out of tailings ponds, overflow from overfilled-by-rain ponds. In general, fracking has been developed in regions without the water complexities that Nova Scotia experiences.
- Offgassing from condensate tanks can be substantial, if accidental – and poorly studied.
- Urban-level smog in rural areas could make Nova Scotia the "LA of the East".
- Risk of respiratory impacts, especially on elderly and children, should not be underestimated.
- Smog/pollutants/industrialization is antithetical to stargazing. What is the cost of the loss of wonder of being able to actually see the Milky Way?

*Water*

- Streams, ponds, springs, wells, lakes, well water and aquifers all at risk (see recent Duke study, if within 1 mile of site, 17 times more likely to have shale-originating methane in well water)
- Nova Scotia wastewater treatment facilities are simply not prepared for high-volume, radioactive, highly chemical-laden, highly-toxic wastewater treatment protocols.
- Distance-to-ocean downstream is always short in NS. There are no other onshore shale-gas drilling projects that have Nova Scotia's water complexities – do we want them to experiment on us?
- Will any tailings treatment be appropriate to Nova Scotia's local geology, water flows, high rains, etc.?
- What are the risks of serious damage, if a fracking-chemical-laden truck accident produces a spill?
- Heavy metal releases into watersheds have uncertain long-term consequences
- When the rest of the world knows that "water is the new oil," and expects water wars in the next decades, why should we risk damaging such a precious resource, one that could soon become its own profit center?
- There are virtually no studies I can find on the ecological effects on water-soaked ecosystems like Nova Scotia's.
- Water table impacts: fracking use could drain small aquifers and lakes, as well as wells; it could salinate water table, as ocean/freshwater equilibria are disturbed (being near to the ocean).
- Unknown effects of vibration of fracking on spawning shellfish and migratory fish, or on acoustically sensitive marine and land animals.
- Extreme weather (hurricanes, very heavy spring rains) may affect or overfill tailings ponds, spreading poisons in unexpected ways.
- Water overconsumption by drillers could disrupt existing systems, since every well poisons millions of gallons of fresh water.
- Any contamination of any aquifer is effectively permanent.
- The impacts can be widespread (up to a mile from the drilling site, because of horizontal drilling), and show up years or decades later: water moves slowly, along with any fracking fluids pumped into it.

*Greenhouse Gases/Climate*:

- The Greenhouse Gas emissions from the lifecycle activities necessary to drill a frack-able well into shale has only been carefully estimated once (the Cornell study), which concluded that it was roughly equal to coal — neither clean nor green. More study is needed, of course — but the current review doesn’t engage this question at all.
- While specifics are debatable, emissions need to be factored into Nova Scotia’s laudable emissions targets for 2020, and so full lifecycle GHGs from such industrial buildup should be reviewed closely by Department of Environment.
- Methane has 20x more impact than CO2; every small leak, therefore, is much worse in term of greenhouse gases.

*Economy*:

- Decreasing property values could lead to decreasing local tax revenue.
- Additional taxpayer costs may be hidden: to maintain roads damaged by carrying superheavy water trucks; from additional health costs; from long-term care of citizens who can no longer work; etc.
- Decrease in regional tourism, resulting from a newly industrialized landscape (and concerns over purity of water + air + land) could decrease overall employment.
- Potential damage to farms and food, if water, air, and soil is affected.
- Potential damage to other business viability, if water supplies are poisoned or of uncertain toxicity.
- Fewer jobs for locals from drilling than most realize — and generally low-pay, short-term jobs, rather than “careers.” Skills will not transfer to high-quality, continuing, sustainable jobs.
- Decrease in immigration to Nova Scotia, if quality of life is degraded.
- Wilderness camps, fishing tourism, hunting tourism all affected by a potentially poisoned environment.
- Potential damage to fisheries, farms, and hunting.
- Potential damage to woodlots and forests from VOCs and landscape degradation.
- Nova Scotia’s North Shore is one of the few rural areas that is growing, and is a model for renewing rural communities; shale gas drilling could destroy it.

*Quality of Life*:

- As said above, our coastal towns, with buildings on either side of the main highway, will become echo chambers as the trucks rumble through, many times an hour.
- Noxious smells and fears ("I wonder if that’s poisonous?") would be routine, for citizens province-wide.
- Uncertainty about water quality would also be routine.
- Visual "eyesores" would spread across the landscape, far worse than clearcutting.
- Rural citizens would get urban air quality (and air quality problems of asthma, COPD, etc.)
- Citizens would be asked to live in an industrialized landscape, with gas flare-offs a constant visual blight, increased traffic causing constant frustration, and strange smells and sights causing stress reactions.
- More clear-cutting and road-cutting, to make paths to drilling pads.
- Drilling rigs are lit 24 hrs/day, their compressors run 24/7 for three weeks, so ambient noise is much higher than currently allowed.
- Many of the pleasures of rural living would disappear: quiet, peacefulness, natural beauty, a livable pace.

"Other potential issues:"

- Community disruption (do we want neighbor vs. neighbor)?
- Political disruption (government blamed for "losing Nova Scotia's brand")?
- Cost/Benefit is likely an overall negative to the NS economy (counting roads/infrastructure/tourism loss/etc. vs. minimal royalties and a few short-term jobs)
- What is the cost/benefit ratio over 10 years, 20 years, 30 years, 50 years? We should be considering these choices over the next century.
- There is the potential for increased seismic activity (see Arkansas' small earthquakes), and their effect on cement well casings, and home and road foundations, over time.
- There is no certainty of the lifespan of "cement well casings" – even if it's 100 years, each well is a time bomb that could be extremely costly to repair.
- In general, drilling would result in a reduction of "wild areas" and wildlife over the province, decreasing its attractiveness and value in the future.
- As more roads and gas-affected areas grow, ecosystems become fragmented, weakening natural resilience.
- Loss of local autonomy and community-specific sustainability development, because external "rights" of gas driller profits would be asserted.
- First Nations treaty rights have not, as far as I can tell, been explored whatsoever.
- Nova Scotia's small landscape is key: nowhere is more than 40 miles from the sea, so all potential impacts are concentrated, and have a very broad impact zone.
- Drilling/fracking companies are not locally-owned, and mostly not even Canadian; therefore the profits go elsewhere, while the damage stays here. Is that economic impact part of the review?
- Loss of initiative and funding for developing local, "sustainable" sources of energy – green options, conservation, "mining" efficiency, etc.
- Seismic risks in general – see the recent, unprecedented storms of mini-quakes in Arkansas; they'd never had that, until a rash of fracking was undertaken last year. We have not built for earthquakes in Nova Scotia – what's the cost if we have to start planning for earthquakes?
- Today's fracking techniques have only been developed in the last five
to ten years (despite industry saying it's been fracking "since 1947," which is hogwash). The technologies have not been closely scrutinized, and have no track record based on objective science, especially across differing geologies, hydrologies, and ecosystem variations.
- Nova Scotia is unlike any of the other regions that have been fracked, yet is getting, as far as I can tell, no special analysis, scientific studies, or special consideration of hydrological, geological, or ecosystem considerations from those who are interested in fracking.

Few of the above list is currently considered in the provincial review, even though each point is clearly important.

The list comes not just from me, but from a brainstorming session of Nova Scotia citizens, thinking this through on one evening. If a small group could come up with such a broad array of concerns mostly unaddressed by the Review, it indicates to me that the issues involved with shale gas hydro-fracturing are *much more complicated than have been acknowledged so far.* *There are far more topics that have not yet been articulated, but that are nonetheless pertinent.*

This says to me that the review needs to be much more thorough, much broader, and much more attentive to long-term consequences, than currently is the case. I trust that these points will be acknowledged and considered, and that a more thorough environmental assessment (including more public input) results from this initial review.

Shale gas hydro-fracturing has the potential to dramatically transform Nova Scotia into a profit centre for the gas industry, at the expense of its citizenry, for generations to come. That is not in Nova Scotia's best interests.

I believe we can do better than that, and that our future population demands a better analysis than that which is currently envisioned. If you'd like reference validation of any of the points referenced above, or would like my transparent involvement in any further review of hydraulic fracturing in Nova Scotia, just let me know at

Best,

Michael Jensen, Susan Stephen, Anika Stephen
May 31, 2011

To the reviewers –

Hydraulic fracturing (fracking) is a complex issue that extends far beyond a mere technology. It may directly affect our ground and well-water, of course, but also will likely affect our air, soil, roads, bridges, economy, health, tourism, property values, and overall quality of life.

The Province’s review, as currently structured, neglects a great many of these possible outcomes. I encourage a full strategic assessment of all of the potential impacts not merely of a specific technology, but of inviting an industry to Nova Scotia that has repeatedly demonstrated utter carelessness with local interests and environmental concerns.

The gas companies themselves, who stand to profit handsomely from extracting our gas by fracturing the shale deep beneath our soil, would be gone in a decade or two, leaving behind a shattered landscape, fractured ecosystems, damaged roads, and precious little else of value to Nova Scotia. This is not considered in the review.

They promise royalties, but of what kind? Strangely, according to the gas companies themselves, wells drilled would receive a two-year royalty holiday from Nova Scotia. Since they anticipate extracting 50% of a well’s gas in the first year, and 25% in the second. Nova Scotia is left with a small percentage of a small percentage, at best. Most of the profits go out of province, as will the gas itself.

They promise jobs, but of what kind? Most of the high-paying jobs will be fly-in, fly-out visiting experts and managers; the rest are the low-quality jobs working within the toxic fumes of the fracking process – leaving any potential health impacts to the Province.

Fracking is fraught with potential for calamity, and if the full costs of allowing gas companies to dominate our landscape for a decade or two are considered, it is almost certain to cost Nova Scotia far more than we gain from paltry royalties.

Few of those costs are considered in the current review.
Every day, it seems there’s a new story about a new study discovering the long-term damage of fracking. One day’s it’s the “discovery” of radiation in the returned fracking fluids; the next day it’s the full-lifecycle carbon costs being much higher than touted; the next it’s the LA-level air quality of Pinedale, Wyoming, a formerly pristine region; the next it’s that the cost to Arkansas for fracking-related road upkeep far exceeded the royalties the state received from the drillers.

Nova Scotia should be in no hurry to frack, until all the facts are in. The Precautionary Principle, as contained in 2(b)ii of the Nova Scotia Environment Act, should be at the base of our decision-making. The scope of the review itself should allow for any outcome, including an outright ban if it poses too great a risk of irreversible damage. The “scope” should not just lead to an outcome that considers “best practices” of other states or provinces. The stakes are too high.

Nova Scotia is a small, clean, lovely province. Those qualities are increasingly valuable, in our rapidly warming world. Nova Scotians have become increasingly wise in our use of our own resources, and unusually, can see rural areas (particularly in the North Shore) that have been slowly growing.

Any review of fracking should acknowledge all that is being risked, since Nova Scotia, as we know it, is at risk from this industry.

Way back before the gas industry moved into Wyoming, I marveled at the crisp fresh air of Pinedale. I’m deeply saddened to learn that now, because of the shale-gas drilling, Pinedale’s ozone and smog levels are worse than Los Angeles on its worst days. I’ve driven through the gas fields of Oklahoma and Texas; I don’t want to see our lovely province tarnish itself into them, in the pursuit of short-term dollars, and then become an industrialized boom-bust landscape, after the frackers leave.

Please look through the following categorized lists of potential impacts. Most are not addressed in the current “review” scope.

Not all of them are certain. But certainly, much of the below would come true, if shale gas drilling becomes part of Nova Scotia’s future.

We can do far better, to help the Province prepare for the next 10, 30, 100 years or more, than the short-term gold-rush economics of hydro-fracking.

Response to Fracking Review,
Soil/Farms/Fisheries

- Toxins of many forms (heavy metals, radioactivity, toxic water, spills) could make any affected family farms worthless for resale, and their products suspect. No studies on long-term toxic impacts exist. This is not addressed by the current review process.
- Poisons could destroy the growth of organic- and local-food-movement farmers. Long-term economic effects such as this are not considered by the current review process...
- If toxics from fracking fluids become part of sewage-treatment sludge, they could compromise vast tracts of land (if the treated sludge is applied to soils) or complicate the handling of all resultant treated waste (landfill near watershed? Landfill near ocean?).
- Potential impacts on lobsters, clams, and other shellfish in near-ocean waters, as well as fish farms, and regional fisheries (if released toxins are ingested by phytoplankton and other base-of-food-chain organisms, and passed on to their predators)
- Endocrine (hormone) disruptors found in fracking fluids could affect farm animals, wild animals, and aquatic animals.

Roads

- Our roads were not designed for the stress of carrying 65-ton trucks hauling millions of gallons of water, chemicals, and tons of sand over them, all day and night long, day after day.
- Our coastal towns, with buildings on either side of the main highway, would become echo chambers as the trucks rumble through.
- Our bridges will be stressed from repeated overweight traffic.
- These costs would be substantial over the next 10-20 years.
- Many roads follow the shoreline; ecology would be disrupted by noise and pollution and risk of spills, and thrumming vibrations risk increasing coastal erosion.
- Road shoulders, with big trucks passing each other, would take a beating – already the case (in miniature) with cement trucks and timber trucks as they pass
- According to extant data, it takes between 250-1200 65-ton 18-wheeler truck trips per well.
Health

- Multiple toxins, like hormone disruptors and carcinogens, could have long-term impact on spiraling health costs for the province;
- Health impacts of the above often occur 5 - 25 years out, long after the gas companies have disappeared.
- Increased stress generally, from massively increased traffic rumbling through towns, and an industrialized landscape, running 24 hours a day, 7 days a week, would have significant health effects.
- Radioactive material is frequently freed from the shale via fracking (see the Marcellus) – the long-term dangers of such material is be clear, though not considered in the review.
- Immediate physical and emotional impact from major disruption, uncertainty, fears of health effects, and loss of control over our local quality of life could have long-term consequences.
- Non-human animal health effects could be substantial: wildlilfe, farm animals, fish, deer, ducks, geese – they don’t read signs not to drink the water, land in the tailings ponds during migration, etc.
- Respiratory illnesses would increase across the province, as has been demonstrated elsewhere
- Risks to Nova Scotia gas-rig workers are poorly understood (as far as I can tell, completely unstudied), and could have long-term impacts.
- Risks of low levels of poisons accumulating over time are substantial, and affect the very old and very young disproportionately.

Tourism/Immigration

- Tourism could be affected significantly, if our landscape is industrialized, our towns loud with truck traffic, our roads congested with fracking rigs, and overall, if we are asking tourists to tour an increasingly unattractive landscape.
- How often have we heard "Nova Scotia? It's so beautiful there," from our friends down South? We don't want to hear "Nova Scotia? It was once so beautiful there." Natural beauty is difficult to review, but should be somehow considered in the review.
- Can Nova Scotia be “Canada’s Ocean Playground” if our landscape has been degraded?
- I’m told that 2000 families have emigrated to Nova Scotia from UK over 5
years, most with means and abilities; that influx could evaporate

- Permanent loss of Nova Scotia’s “brand” for good stewardship of land, water, and sustainable development
- Vibrant rural development (the North Shore has been growing in population) may be halted, even reversed.
- Peace, quiet, and loveliness is what tourists want – if that image is tarnished, it will be exceedingly hard to recover.

Air

- Volatile Organic Compounds (VOCs: endocrine disruptors, carcinogens, toxins, etc.) are emitted as part of the drilling/fracking process, often intentionally, from “evaporation” ponds – these can have profound effects on air quality.
- Increased pollutants from truck traffic all day every day – diesel fumes, microparticles, and urban toxins that increase asthma and other respiratory problems.
- Well methane/gas leakage, which has been poorly studied, would likely damage air quality, and could have long-term atmospheric climate impacts.
- Worker exposure to concentrated toxins around fracking site causing long-term respiratory damage.
- Downwind problems (see Pinedale, Wyoming, and many other locales).
- Any extreme weather (hurricanes, flooding, torrential downpours) could spread poisons in unexpected ways – sprays out of tailings ponds, overflow from overfilled-by-rain ponds. In general, fracking has been developed in regions without the water complexities that Nova Scotia experiences.
- Offgassing from condensate tanks can be substantial, if accidental – and poorly studied.
- Urban-level smog in rural areas could make Nova Scotia the “LA of the East”
- Risk of respiratory impacts, especially on elderly and children, should not be underestimated.
- Smog/pollutants/industrialization is antithetical to stargazing. What is the cost of the loss of wonder of being able to actually see the Milky Way?

Water

- Streams, ponds, springs, wells, lakes, well water and aquifers all at risk (see recent Duke study, if within 1 mile of site, 17 times more likely to have shal-
originating methane in well water)

- Nova Scotia wastewater treatment facilities are simply not prepared for high-volume, radioactive, highly chemical-laden, highly-toxic wastewater treatment protocols.
- Distance-to-ocean downstream is always short in NS. There are no other onshore shale-gas drilling projects that have Nova Scotia's water complexities – do we want them to experiment on us?
- Will any tailings treatment be appropriate to Nova Scotia's local geology, water flows, high rains. etc.?
- What are the risks of serious damage, if a fracking-chemical-laden truck accident produces a spill?
- Heavy metal releases into watersheds have uncertain long-term consequences
- When the rest of the world knows that "water is the new oil," and expects water wars in the next decades, why should we risk damaging such a precious resource, one that could soon become its own profit center?
- There are virtually no studies I can find on the ecological effects on water-soaked ecosystems like Nova Scotia's.
- Water table impacts: fracking use could drain small aquifers and lakes, as well as wells; it could salinate water table, as ocean/freshwater equilibria are disturbed (being near to the ocean).
- Unknown effects of vibration of fracking on spawning shellfish and migratory fish, or on acoustically sensitive marine and land animals
- Extreme weather (hurricanes, very heavy spring rains) may affect or overfill tailings ponds, spreading poisons in unexpected ways
- Water overconsumption by drillers could disrupt existing systems, since every well poisons millions of gallons of fresh water
- Any contamination of any aquifer is effectively permanent.
- The impacts can be widespread (up to a mile from the drilling site, because of horizontal drilling), and show up years or decades later: water moves slowly, along with any fracking fluids pumped into it.

**Greenhouse Gases/Climate**

- The Greenhouse Gas emissions from the lifecycle activities necessary to drill a frac-able well into shale has only been carefully estimated once (the Cornell study), which concluded that it was roughly equal to coal – neither clean nor
green. More study is needed, of course – but the current review doesn’t engage this question at all.

- While specifics are debatable, emissions need to be factored into Nova Scotia's laudable emissions targets for 2020, and so full lifecycle GHGs from such industrial buildup should be reviewed closely by Department of Environment.
- Methane has 20x more impact than CO2; every small leak, therefore, is much worse in term of greenhouse gases.

**Economy**

- Decreasing property values could lead to decreasing local tax revenue;
- Additional taxpayer costs may be hidden: to maintain roads damaged by carrying superheavy water trucks; from additional health costs; from long-term care of citizens who can no longer work; etc.
- Decrease in regional tourism, resulting from a newly industrialized landscape (and concerns over purity of water + air + land) could decrease overall employment
- Potential damage to farms and food, if water, air, and soil is affected;
- Potential damage to other business viability, if water supplies are poisoned or of uncertain toxicity.
- Fewer jobs for locals from drilling than most realize – and generally low-pay, short-term jobs, rather than “careers.” Skills will not transfer to high-quality, continuing, sustainable jobs.
- Decrease in immigration to Nova Scotia, if quality of life is degraded
- Wilderness camps, fishing tourism, hunting tourism all affected by a potentially poisoned environment
- Potential damage to fisheries, farms, and hunting
- Potential damage to woodlots and forests from VOCs and landscape degradation.
- Nova Scotia’s North Shore is one of the few rural areas that is growing, and is a model for renewing rural communities; shale gas drilling could destroy it

**Quality of Life**

- As said above, our coastal towns, with buildings on either side of the main highway, will become echo chambers as the trucks rumble through, many times an hour.
- Noxious smells and fears ('I wonder if that's poisonous?') would be routine, for
citizens province-wide.

- Uncertainty about water quality would also be routine.
- Visual “eyesores” would spread across the landscape, far worse than clearcutting.
- Rural citizens would get urban air quality (and air quality problems of asthma, COPD, etc.)
- Citizens would be asked to live in an industrialized landscape, with gas flare-offs a constant visual blight, increased traffic causing constant frustration, and strange smells and sights causing stress reactions.
- More clear-cutting and road-cutting, to make paths to drilling pads.
- Drilling rigs are lit 24 hrs/day, their compressors run 24/7 for three weeks, so ambient noise is much higher than currently allowed.
- Many of the pleasures of rural living would disappear: quiet, peacefulness, natural beauty, a livable pace.

Other potential issues:

- Community disruption (do we want neighbor vs. neighbor)?
- Political disruption (government blamed for "losing Nova Scotia’s brand"?)
- Cost/Benefit is likely an overall negative to the NS economy (counting roads/infrastructure/tourism loss/etc. vs. minimal royalties and a few short-term jobs)
- What is the cost/benefit ratio over 10 years, 20 years, 30 years, 50 years? We should be considering these choices over the next century.
- There is the potential for increased seismic activity (see Arkansas’ small earthquakes), and their effect on cement well casings, and home and road foundations, over time
- There is no certainty of the lifespan of “cement well casings” – even if it’s 100 years, each well is a time bomb that could be extremely costly to repair.
- In general, drilling would result in a reduction of “wild areas” and wildlife over the province, decreasing its attractiveness and value in the future;
- As more roads and gas-affected areas grow, ecosystems become fragmented, weakening natural resilience.
- Loss of local autonomy and community-specific sustainability development,
because external “rights” of gas driller profits would be asserted.

- First Nations treaty rights have not, as far as I can tell, been explored whatsoever.
- Nova Scotia’s small landscape is key: nowhere is more than 40 miles from the sea, so all potential impacts are concentrated, and have a very broad impact zone.
- Drilling/fracking companies are not locally-owned, and mostly not even Canadian; therefore the profits go elsewhere, while the damage stays here. Is that economic impact part of the review?
- Loss of initiative and funding for developing local, sustainable sources of energy – green options, conservation, “mining” efficiency, etc.
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This says to me that the review needs to be much more thorough, much broader, and much more attentive to long-term consequences, than currently is the case. I trust that these points will be acknowledged and considered, and that a more thorough environmental assessment (including more public input) results from this initial
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I believe we can do better than that, and that our future population demands a better analysis than that which is currently envisioned. If you’d like reference validation of any of the points referenced above, or would like my transparent involvement in any further review of hydraulic fracturing in Nova Scotia, just let me know at

Best,
Michael Jensen, Susan Stephen, Anika Stephen
From: "Susan Ross"
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 7:59 AM
Subject: Fracking in Nova Scotia

Hello,

It is with great pleasure that I read that the Government of Nova Scotia has
launched a review of fracking in the province. I understand that the scope
of the review is essentially limited to gathering information on
environmental issues with a view to arriving at recommendations for any
regulatory change. I have little to contribute to the review on
environmental issues - although professionally I am an environmental and
social impact assessment specialist, I have no experience with projects that
include fracking.

I am however extremely interested in the results of the review, and the next
steps. I have reviewed the information on the websites of the departments of
energy and environment to try to better understand what the current
situation with fracking is, what environmental approvals are required (for
exploration and for construction/operations) and what public consultation is
required as part of those approvals. Although this is my field, I have to
confess the websites succeeded mostly in confusing me. Accordingly, i) sent an email (Askus@gov.ns.ca) on May 14, asking for clarification on off
and on shore regulatory requirements, ii) received a response that
essentially repeated some information on the websites and referred me back
to the internet, and iii) immediately sent a (hopefully clearer) email
requesting more specific information on the requirements for i) regulatory
approvals, ii) public consultation and iii) information disclosure for
exploration on shore for oil and gas. But I have yet to hear back.

With regard to the review I would like to note:

1. I live in Antigonish County (and depend on its groundwater),
virtually all of which is under an exploration license held by Forent
Energy. Forent has declared they will not frack in their exploration license
area near Truro but provide no information on their intentions in Antigonish
County. Normally one would assume the lack of information is because there
is none yet, but giving the controversy over fracking, one might suspect
that the public declaration in Truro was simply because the resource is not
amenable to fracking, whereas the Antigonish resource may be?

2. The fact sheet on the department of energy's website reads to me a
bit more like an advocacy piece for fracking than a fact sheet. For example,
"Close to half a million wells have been hydraulically fractured in these
three provinces (B.C. Alberta and Saskatchewan) with (presume this should be
'without') any incidents noted" does not seem exactly accurate, although I
suppose it depends on the definition of 'incident'? And "Most issues
attributed to hydraulic fracturing have been traced back to poor drilling practices rather than the fracture operation itself" begs the question of what the other 'issues' were attributed to? (I take it that 'issues' are different from 'incidents'? Or perhaps the issues occurred outside the three provinces?)

3. Point 2 above raises the question of whether an internal review (as opposed to an independent review to the extent that such a thing is possible), without definition of how "outside experts in certain subject areas" will be chosen for bringing in, is appropriate where the internal reviewers may have already taken a position on fracking?

4. Since to date I have been unable to clarify just what the regulations are, the whole issue of recommendations to change those regulations seems a bit muddy. It seems that a clear explanation of the regulations, as context for recommended changes, would be helpful to understanding the report that is produced?

5. I would like to be assured that there will be public consultation on the report that results from the review, as well of course of full disclosure on the report and the processes put in place to produce it. There is no such undertaking that I have found on publicly available materials (I may have missed something).

6. Unless the report concludes that there are no environmental consequences of fracking, or at least none that can't be managed into effectively no consequence, then it seems further steps will need to be addressed before recommended changes to the regulatory framework are implemented - for example, before deciding that fracking can proceed, shouldn't there be analysis of the potential for benefit relative to the potential for environmental consequence? One might also conclude, from reading various materials on the website, that the option of not permitting fracking in Nova Scotia is not really on the table - shouldn't it be?

Thank you for your attention.

Susan Ross
From: <frac-review@gov.ns.ca>
To: <groundwater@ecologyaction.ca>
CC: 
Date: 6/1/2011 9:24 AM
Subject: Fracking review
Attachments: Fracking letter June 1.doc

June 1, 2011

To: Fracking review committee

From: Veronika Brzeski

Re: Hydraulic Fracking Review

Dear Team of Senior Technical and Policy Staff,

I live in St. Ann's Bay, Cape Breton and am involved in fisheries work on this coast as well as on the Gulf coast, in Cheticamp. Water is an important resource to all of us and it is a fragile system that requires careful handling and preserving. I have travelled and worked in areas of the world where it was a scarce commodity and it certainly affects people’s lives as well as the resources they depend on.

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

I am concerned about the effects that fracking will have on groundwater and surface water. Our fisheries rely heavily on freshwater input into the ocean. Our salmon, which is always at risk of extinction, relies on the health of our streams and rivers. I am concerned not only of the possible pollution and contamination leaching into the ocean but also by the reduction of water caused by fracking.

While the government pushes "sustainability" and "resource protection" in the fishery, it should also use the same words in land-based developments that would affect it. Our fisheries require active protection, whereas our minerals, gases and oils will not disappear in time - they will be there forever, or until such time as we develop technologies to exploit them that would cause minimal risk to our natural "renewable" environment.

Please protect our renewable resources! Let the industry develop better methods of extracting our mining resources and provide proof of their low impact before approving such activities in our province.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Veronika Brzeski
June 1, 2011
To: Fracking review committee
From: Veronika Brzeski
Re: Hydraulic Fracking Review

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Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Veronika Brzeski
From: <frac-review@gov.ns.ca>
To: 6/1/2011 10:41 AM
Subject: BAN FRACKING IN NOVA SCOTIA

My name is Cyril Smith

I am from Antigonish Nova Scotia and I live near the Antigonish Harbour...

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

1. Effects on groundwater – undetermined and more usages
2. Use and effects on surface water
3. Impacts on land, such as potential soil contamination – very important consideration
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids Is this being done ??? We don’t trust the monitoring system
6. Site restoration if THIS IS ANYTHING LIKE THE RESTORATION OF THE TAR SANDS IT WILL BE A SIMILAR FARCE
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Cyril J. Smith
From: Jan Watson
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 10:44 AM
Subject: Fracking being halted in many countries

Important information please read.....

New York state sues federal government over shale gas drilling

UK company halts shale gas fracking after scientist say it may have triggered earthquakes (the first in UK history)
From: "Doreen Smith"
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 10:46 AM
Subject: Fw: Fracking

From: Doreen Smith
Sent: Tuesday, May 31, 2011 10:04 AM
To: frac-review@gov.ns.ca
Subject: Fracking

To whom it may concern; I am from Antigonish, N.S.

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments. The following are issues that need to be seriously considered when removing fuels from the substrate

1. Effects on groundwater
2. Use and effects on surface water
3. Impacts on land, such as potential soil contamination
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids
6. Site restoration
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Doreen M. Smith,
From: "Ken Harrison"
To: <frac-review@gov.ns.ca>
CC: <MIN_ENV@gov.ns.ca>, <ENERGYMINISTER@gov.ns.ca>, <premier@gov.ns.ca>
Date: 6/1/2011 10:55 AM
Subject: Hydraulic fracturing review comments
Attachments: Submission - by June 6th, 2011.docx

Good morning,

Please find attached my comments on the issue of hydraulic fracturing for the Hydraulic Fracturing Study committee.

My comments are in the form of a Word document. If you wish another format for the submission, please let me know.

Thank you.

Sincerely,

Ken Harrison

Ken J. Harrison
June 1, 2011

Re: Hydraulic Fracturing

Dear Senior Technical and Policy Staff Team,

Rather than restating the many excellent points raised by [name] of Mount Hanley in her submission, I will briefly mention a few critical points:

1. Water contamination: The introduction of the high volumes of water laced with numerous chemicals into the underground aquifers in Nova Scotia is simply reckless. Drilling depth is irrelevant. Leaks and spills will happen. If something “can’t possibly leak from deep drilling back to near-surface aquifers”, it will find its way down from surface spillage of “flow-back water” or leaks or improper disposal of the wastewater. Pre-existing cracks or unexpected cracking of geological formations is virtually guaranteed. The presence of arsenic and radioactive materials in our underlying geology is well known. Is there any effort to obtain complete baselines for these natural materials and the components of hydraulic fracturing fluids in private water wells? Do we only react when evidence and hardship to individuals or communities becomes unbearable?

The precedent of ground water contamination was established decades ago as a side effect of mining and exploitation. Future contamination must be expected whenever hydraulic fracturing or any similar invasive technique is used. The potential for long distance contamination from hydraulic fracturing is unique.

2. Hydraulic fracturing elsewhere: This technology is considered to be too risky by several overseas jurisdictions and I understand that a potential class action suit is proposed in western Canada. Class actions are being pursued in the United States.

3. Economic benefit: Minimal at best. The resource is rapidly depleted. Jobs are few.

4. Can we rely on promises of regulation and enforcement? Regulations are painfully slow to be produced and lack the means of proper enforcement. It is far too easy to rely on luck. Nova Scotia doesn’t have a stellar record. The Westray disaster proved that enforcement was an empty promise.

My bottom line: There is no case to be made for ANY hydraulic fracturing in Nova Scotia.

Thank you.

Ken J. Harrison
From: "Leslie Wade"
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 11:26 AM
Subject: submission

To the frac-review committee: I understand that your committee is seeking feedback regarding hydraulic fracturing in Nova Scotia.

I am deeply disturbed about a number of things around this issue: that test wells have already been drilled in Nova Scotia and that a deal has been signed with a gas company in 2009; that this process is even being considered in view of the huge consequences to the environment. The millions of litres of water, tons of sand and hundreds of toxic chemicals pumped into the ground, polluting local wells, carbon emissions created from hundreds of truck traffic as well as air pollution from the wells. Thousands of these wells have already been drilled in the U.S. resulting in a number of wells and water courses being polluted, people and animals being sick. Alberta has experienced similar problems with a current lawsuit by one individual whose water has been destroyed by this process. In Nova Scotia we have the added risk of arsenic and uranium in the ground which could result in radioactive waste water being retrieved from the wells.

For the benefit of a few jobs over the short term the long-term costs are far too great to consider this process.

Please review this issue wisely.

Sincerely,

Leslie Wade
From: sydney blum
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 1:02 PM
Subject: regarding Fracking review scope

June 1, 2011

Dear Government Representatives,

I chose Nova Scotia because of its record on and goals for green living and sustainability, for proudly having some of the purest water in the world, for thoughtful growth, for strong community, and tireless volunteerism.

The well-being of our earth, air and water is directly related to our personal wellness and the well-being of our world. Mental health, mental stability, may be one of the obscure and forgotten losses that may come with the radical change to our environment and community if hydrofracking for shale gas were to come to this area. Mental health needs to be added to the long list of concerns and potential consequences of hydrofracking for shale gas (and now possibly for oil too) that are being voiced internationally and leading to more scrutiny of the process of shale gas extraction.

I am adding my name to the many people who are expressing their concerns that the scope of the review of fracking in Nova Scotia needs to be broadened to include all the possible impacts of shale fracking.

*there needs to be clarity and transparency regarding a complete list of the chemicals used in the exploration and fracking process and their potential effects—short and long term—on air, water, land
*the potential leaching into our aquifers, streams, and sea water
*whether the fracking process can guarantee that the wells will be sealed against leaching in the short and long term *consequences of excessive noise and truck traffic
*overuse of already fragile local roads and the costs of upkeep and repair
*where the huge amounts of water will come from that are used in the fracking process
*where the polluted water that is recovered from the fracked well will be dumped
*what happens with the polluted water that cannot be recovered?
*infrastructure, and health facilities that may be overburdened by stressed or ill community members and temporary laborers *economic impact on our seasonal population of cottagers and tourists who might not return if soil and water is polluted or the landscape torn up and reshaped by drilling
*loss of real estate values due to proximity to fracking sites and possible pollution
*loss of tax dollars and pensions from retirees who choose to settle here because of the clean environment and quiet community
*impact on local farming if the air and water becomes polluted and farmers are unable to grow crops and feed and water their animals safe
*polarization of community members, once tightly united, and the
emotional toll on the community when large companies come into an area with no real tie or commitment to the area beyond financial gain and then leave quickly

*compromise to the cohesion of the community—the life force in a rural setting—from uncertainty, disruption, environmental contamination

*acute and chronic illness due to possible pollution; ongoing stress, anxiety and depression as a consequence of exposure to chemicals in the environment and irreversible changes to the well being of the community.

I feel these, as well as others that I have undoubtedly missed, must be considered in a thorough review.

Sincerely,
Sydney Blum RSW
From: "Frac-Review" <frac-review@gov.ns.ca>
To: 6/1/2011 3:56 PM
Date: Hydrauic Fracturing for Shale Gas in Nova Scotia

Subject: To the Minister of Energy and Environment,

Twenty-seven years ago I chose to live in the beautiful foothills of the Cobequid Mountains on Nova Scotia's north shore. The government's recent initiative inviting bids for shale gas exploration in Nova Scotia is alarming and I welcome the opportunity to submit comments on the scope of the review of hydraulic fracturing for shale gas.

There is little doubt that you will have received many letters relating the myriad issues relating to hydro-fracking and that there is also a good deal of counter-information and misinformation provided by those in the gas/oil industry.

I want to draw your attention to a very fundamental and pressing concern. We are privileged to live (and some of us very deliberately chose Nova Scotia) in a province where the air is clean, the water pure and delicious and the ground is fertile. The gas/oil industry would have us believe they will do nothing to threaten or spoil the province's natural resources. Studies indicate that this is rather short on the truth of drilling for shale gas through the process of hydro-fracturing. There is no return to clean air, pure water and fertile ground once there is contamination. At a time when the price of water competes with the price of gas per litre, can we sacrifice our water in the hopes of an economic gain in the short term? Can it ever be considered ethical to put the lives of mostly rural people at risk?

Consider some of the real costs of fracking

- the use of millions of litres of water to frack for shale gas - how is it that we can allow potable water to be used in this way for industry?
- the effects of the release of volatile organic compounds
- the damages to the road infrastructure
- the reduction of wildlife areas and fragmented ecosystems, and impact on fisheries
- the effect on organic growers - be it organic farms, meat operations, blueberry production
- the disadvantage of citizens to fight against industries which have the backing of millions of dollars in the event of contaminated water/land/air
- the loss of tourism and immigration and diminished quality of life
- the impact on health from the chemicals used in fracking - cancers, endocrine disruption, respiratory damage

...and then ask who is bearing the real cost of fracking. Nova Scotia is a small province and fracking is big business with a devastatingly huge impact on the landscape. In this part of the province it is not
uncommon for drilled wells to find salt rather than fresh water. We are grave risk for the shale gas industry and geologists cannot predict how the drilling will affect the layers of earth beneath our feet, how to control the methane gas that is released, or to know how or where fresh water will be affected.

I would argue that the potential for harm is too great to allow for fracking. Fracking poses a threat of serious and irreversible damage. Ensuring industry and regulatory best practice is of little value as long as the shale gas industry hides behind proprietary practices and does not disclose what chemicals it is using in the process of fracking and of little use when damage is done. Best practice is a hollow promise for the well being of our citizenry.

I urge the Government of Nova Scotia to review all the direct and indirect impacts, all the risks and potential consequences for Nova Scotia in the short and long term of hydraulic fracturing. The review should absolutely be based on the precautionary principle as outlined in the Environment Act, Section 2 (b) ii (http://nslegislature.ca/legc/statutes/envromnt.htm). Any evaluation of fracking should be independent of government and industry interests and allow for access to all information and to full public participation. And clear as it appears to me, we would be no more than a puppet to industry if the province does not place a ban on this practice.

With high hopes that this government act honourably, ethically and in the interests of its people and lands first and foremost,

Debra Plestid
From:         "Frac-Review" <frac-review@gov.ns.ca>
To:           "Charlie Parker" <energyminister@gov.ns.ca>
CC:           
Date:         6/1/2011 3:57 PM
Subject:      Fracking

On April 22, a relatively small group of people, who were concerned about the possibility of shale gas exploration and extraction using hydraulic fracturing, gathered in front of the Nova Scotia legislature building to show their concern, and to push for the banning of this practice before it happens again. The word again is interesting, because even though we had been told by the Minister of Energy, Charlie Parker, that fracking had not occurred in this province and no licences had even been applied for, this was not true. Fracking has happened in what is now known as the Windsor block, by the company involved. The area is otherwise known as Home for thousands of people and lush fertile farm land as well.

The people who went to protest fracking were from Lake Ainslie, in Cape Breton. Many were from the Tatamagouche area [another block], as well as from Amherst [Truemanville block] and the Pictou area [Scotsburn block]. A few people were from Halifax and area but very few, and I expect that most people who saw reports on the news thought very little about it or wondered what all the fuss was about. Well there are many issues to make a fuss about. Perhaps first of all is water. In these lovely rural areas, almost everyone relies on wells for their water. So it is easy to understand why people might worry that having five, ten, fifty or maybe one hundred wells drilled through their water table, far below to the shale layer, and then many horizontal rays fanning out for one two or more kilometers, which will then be fractured with millions of gallons of water, and a huge volume of chemicals, which are proprietary knowledge, but many of which are known to be carcinogenic, will almost certainly be a disaster for someone, and maybe many many people.

What would the residents of HRM say if they were told that next year, this procedure is going to start beside and under the Pockwok water supply? But they should not worry, because best practices will be used, and it is very unlikely that anything will go wrong, but if it did the company would supply the city with a suitable replacement for their loss. From where? Does this sound far fetched? There were plans to drill in the town of Sackville, New Brunswick until public outcry put a stop to it.

Northern Nova Scotia is known as cottage country, and the north shore is on the Sunrise trail. I somehow cannot imagine tourists flocking to the Gas Rig Trail where they could take in dozens or maybe hundreds of two to three acre gravelled clearings with hundreds of trucks travelling to and from them every day. And how much enjoyment will someone get relaxing at a cottage in an area like this? How long before the underground water has been depleted and replaced by an inflow of salt water, which is often found only a few feet below the fresh water supply? Who in their right mind would even consider risking something this precious except someone who doesn't live here? Think again Premier Dexter, and stand up to the immense pressure being exerted by the exploration companies who have nothing to lose when things go wrong and will just appear somewhere else under another name with more assurances, and no conscience.

David Baxter
From: Dan Kustudich
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 4:32 PM
Subject: Stop degradation of our WATER aquifers in Nova Scotia!

Hello to all decision makers,

In their insatiable GREED the so called "economists" are trying to extract all the remaining resources from Earth's biosphere, regardless what kind of damage to it and whole society is done in the process!

Environmental impacts on water, soil, forests, wildlife, as well as serous health impacts, and economic impacts on agriculture and on rural communities should be a priority in protecting the society by STOPPING any activity which endangers them!

Therefore, I am joining many concerned Nova Scotian citizens and asking our elected government representatives to STOP and prevent any further promotion of extracting resources by fracking process - and disturbing the water aquifers!

Dus'an (Dan) Kustudic,
From: Nyima Wimberly 
To: <frac-review@gov.ns.ca> 
Date: 6/1/2011 6:01 PM 
Subject: Fracking

Hello,

Simply put, the process of hydraulic fracturing has enough reasonable opposition that it should be banned, at least for the time being, perhaps 10–20 years. In the future, after many others have let their land be spoiled or have sold this valuable and non-renewable resource for next to nothing, maybe then, there will be enough advancement in the science of “fracking” to have it be done safely. For now there can be no guarantee. It would be absolutely negligent.

I am writing to ask you to represent the interests of Nova Scotians now and for generations to come by banning “fracking.” Please put long-term well-being ahead of the advertised phantom benefits of this possibly disastrous endeavor.

All the best,

Nyima Wimberly
From: Carla Conrod
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 6:44 PM
Subject: Really Review Fracking from an Environment Standpoint

RE: Hydraulic Fracking Review
frac-review@gov.ns.ca
Hydraulic Fracturing Study,
Environmental Science and Program Management Division,
Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8

1. Nova Scotia’s “Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia” as presently defined does not answer essential questions:
   Should fracking be allowed in Nova Scotia?
   Is the potential for harm too great to allow fracking?
   Do the public get a say in this decision making?
   Is our tap water going to be dangerous like in Alberta where it could catch on fire?
   How much land will be destroyed and who owns it?
   What will the effect of fracking be on future generations?
   How many homes will be destroyed and loose value? Whose homes are they?
   How much farmland will be destroyed?

2. Any evaluation of fracking should be based on the precautionary principle as per Section 2 (b) ii of the Environment Act, (http://nslegislature.ca/legc/statutes/envromnt.htm,) and should consider all principles outlined in Section 2, including sustainability, because evidence indicates that fracking has the potential to cause serious and irreversible damage.

3. The review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term.

4. Potential impacts and risks include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. (A fuller list of issues is available at http://www.stopfrackinginnovascotia.ca/, click on Take Action)

5. The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to “make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province.” www.gov.ns.ca/nse/pollution prevention/docs/Scope.Hydraulic.Fracturing.Review.pdf

6. Any evaluation of fracking should be independent of government and allow for full public participation and access to information.

7. First Nations should be consulted.
8. Are you being responsible for the next generations and their ability to enjoy this beautiful land and are you being responsible for wildlife who have no voice?

I look forward to your response.

Sincerely,

Carla Conrod

"To restore harmony and balance to the Earth, our Mother, we must learn that Mother Earth is not a resource, but the very source of life itself." - Chief Orval Looking Horse

*Everything in Nature is our source of life. If these things are not kept, we are not living up to our responsibilities that have been given to us by the Creator. Nature has rights, humans have responsibilities. Our responsibility is to represent those species that cannot speak for themselves. Nutukulink – Everything must be sustaining. You must sustain yourselves. You cannot compromise the ecological integrity of the earth or the ability of future generations to sustain themselves or the ability of future generations to enjoy the beauty that the Creator has given us. *-Albert Marshall, Mi'kmaw Elder, Eskasoni, Nova Scotia, from workshop “Two Eyed Seeing”, Tatamagouche Centre, 2009

more information at about Two Eyed Seeing

http://www.integrativescience.ca/

*So this is what we truly believe. This is what reinforces our spiritualities: that no being is greater than the next, that we are part and parcel, we are equal, and that each one of us has a responsibility to the balance of the system.*

- Albert Marshall, Mi'kmaq Elder, from an interview in Taking Charge of the Bras d'Or: Ecological Politics in the 'Land of Fog'
From: Paul Gervason
To: <frac-review@gov.ns.ca>, <premier@gov.ns.ca>, "Jim Morton, MLA" <jimmort...
Date: 6/1/2011 7:26 PM
Subject: frac-review submission

This note is being sent to the frac-review committee, in response to its invitation to interested Nova Scotians to air our views on the frac-review process now under way.

I am a citizen of Nova Scotia, and have lived in this province most of my life. But I am also an Economist, and have practiced that profession for more than 45 years. That work has included, from time to time, doing economic analyses of environmental projects. I am in fact doing one such project right now, but it has nothing whatsoever to do with the frac process, or that whole industry.

One of the things I have learned in that work is that short-term benefits are much easier to quantify than long-term costs, particularly "social costs." That certainly gives me pause for thought, and for caution, in respect to the possibility of fracking being permitted in this province before we fully understand the long-term costs that will be borne by Nova Scotians in future.

On a practical level I am concerned with the sheer volume of materials, including some which are toxic, or likely to prove to be toxic in future, that are needed in the frac process. I am likewise concerned with the impact of these materials on wells and water supplies. These impacts can be very pervasive, and extend well beyond the area directly being drilled. And they can be of long duration, if not permanent. Even on the surface, there is the potential for long term damage and disruption of existing activities, which includes farming and forestry activities.

Some of these downstream consequences have already been revealed in other fracking jurisdictions (for example, New York State, and Pennsylvania, and Alberta.) And this has already led to litigation which could continue for decades.

The benefits of fracking for gas are largely short-term, and mostly private. The costs, from beginning to end (right up to the remediation, hopefully, of sites after gas extraction is completed), are very largely public, and social. I hope in the process of this review the frac committee will place adequate weight on those costs, and on those who will be bearing them.

Thank you for the opportunity to present these views.

Paul Gervason
From: Shirley Brinkhurst  
To: <frac-review@gov.ns.ca>  
Date: 6/1/2011 8:01 PM  
Subject: Fracking review

Dear Sir,
Yet again I wish to express my deep concerns about Fracking (and oil investigations) in Nova Scotia. Having lived in England, and various Provinces, I have ended up in Tatamagouche, and experienced the delights of Nova Scotia, I was horrified to learn of the possibilities of fracking, and although the Fracking Review will look at the Water issues I feel strongly that it does not go far enough. By now we must all be aware of the severe risks to the water tables, domestic water supplies, fresh/clean water generally, and the huge quantities demanded of the drilling processes. But what of the other issues - the threat to wildlife and the environment, farming and other established occupations, the atmosphere, the mental and physical health of people, deep seated geological structures that result in earthquakes, the effect on homes and the general quality of life? These must be considered too.
Man is very arrogant and frequently feels he can do anything through technology - recent world events have surely shown us otherwise, and nature seems to retaliate in unforeseen ways - some countries and States have seen fit to ban fracking, - Nova Scotia should do the same.
Shirley Brinkhurst
From: michele kustudic
To: <frac-review@gov.ns.ca>
CC: Darrell Dexter <premier@gov.ns.ca>, Ramona Jennex <ramonajennexmla@beila...
Date: 6/1/2011 9:45 PM
Subject: Review of Hydraulic Fracturing for Shale Gass in Nova Scotia

To the Hydraulic Fracturing Study, Environmental Science and Program Management Division, NS

Thank you for inviting the citizens of Nova Scotia to offer input regarding your proposed review of "fracking" in our province. Although I am pleased that you have asked for public opinions on the subject, I am most unhappy to learn that some fracking has already taken place, with companies being granted government leases, and without any consultation with citizens.

From what I have read regarding your request for input from the public on this matter, it seems to me that you are asking the wrong question in your "review". The salient question should be, "Should fracking be allowed in Nova Scotia at all, or is the potential for harm too great to allow it?". Instead, you seem to be more focused on whether the process is/would be meeting acceptable levels of industry practice.

Fracking for natural gas is being carried out in several areas of North America, including the south-west of the US, some of our own prairie provinces, now even New Brunswick, with greedy eyes lustig to see their dangerous, dirty process being carried out in Nova Scotia. As those who have seen the excellent documentary film GASLAND, know, there are many risks and dangers associated with digging deep into the earth, forcing huge amounts of water, sand, and chemicals (some of them toxic) into these "wells" and shattering the shale in order to release the gas.

The potential dangers and risks of this process are many, including deleterious effects on animal and human health, environmental impacts, economic consequences to industries such as agriculture and tourism, as well as impacts on rural communities and interruption of their peaceful way of life.

Any evaluation of fracking should be independent of government, and should allow for full public participation and access to information. The scope of the Review should be not just the 'goodies' to be reaped in the immediate future (and then, as I understand it, not by Nova Scotians, but by those who would ship the gas obtained by destroying our landscape and way of life to lucrative markets in the U.S.). Rather, it is imperative that the long-term effects of this fracking activity on water tables, geological stability, integrity of ecosystems, health and safety of human and non-human inhabitants of the area over a number of future generations, also be given most serious consideration, before allowing this type of activity to proceed.

Respectfully,

-Michele Kustudic
From: Diana Church  
To: <frac-review@gov.ns.ca>  
Date: 6/1/2011 10:19 PM  
Subject: NO Fracking

Hi everyone,

How on god's earth can you expect to inject, under high pressure, thousands of gallons of fresh water mixed with thousands of gallons of toxic chemicals into shale and not expect negative repercussions.

"With regulations", the corporations reaping the vast majority of the financial benefits will be expected to provide potable water for the people who have lost their water supply.

Well. . . . What about the water supply for the animals, the crops, the trees, the birds, the bees, the insects, the grass - that is, all life (including human) on the planet that requires clean water for life and health.

Enough already!

And here's the latest story:


I can't believe test wells are already being allowed. Where do you think the poison goes? To hell? You would be making hell on earth.

Not to mention the pollution to the atmosphere from the exhaust from all the trucks hauling the poison and water to the site. And the roads these trucks will be tearing up at the tax payers expense.

And Nova Scotia would receive a pittance of the profit in royalties charged, and a few temporary jobs . . . none of the gas . . . and all of the devastation left behind.

Wake up!

Diana Church
From: John and Nhun
To: <frac-review@gov.ns.ca>
Date: 6/1/2011 10:46 PM
Subject: Comment re. hydraulic fracturing for shale gas

To: Hydraulic Fracturing Study, Nova Scotia Environment

From: John Sollows, Executive Director,
Tusket River Environmental Protection Association,
P. O. Box 103,
Tusket, N. S.,
B0W 3M0.

Date: June 1/11

We would like to add our voices to those advocating a cautious approach to the exploration and development of shale gas resources through fracturing. A moratorium on the practice is highly advisable. Our reasons follow:

(1) Rural residents in areas where fracking has occurred often report health problems, unusable well water, and air pollution. While incontrovertible proof of a cause-effect relationship may be impossible to achieve, the circumstantial evidence is strong enough to put the burden of proof on advocates of fracking, to show that it cannot cause such damage.

(2) The resources needed to extract natural gas from fracking wells can be enormous, and include chemicals, some unknown, which can have adverse effects on both human health and the environment. The energy needed to transport these resources to the wells makes us question how clean the resulting natural gas would be.

(3) The provincial economy is currently hurting, so the temptation to support short-term fixes may be strong. If such fixes are environmentally hazardous, the long-term costs can seriously outweigh the short-term benefits. Some of these costs may be difficult to measure. Their gravity can still be enormous.

We request a moratorium on shale gas exploration and exploitation until the environmental and health risks associated with this practice are completely
understood and eliminated. The value of fossil fuels is only going to rise in the long run, so what's the hurry to exploit them?
Dear Madam/Sir, frac-review@gov.ns.ca

I am writing about the scope of the review on “fracking as proposed by the Nova Scotia government.

I am concerned by the limited scope of the review for the following reasons.

1) The government has not given a definition of what it means by “fracking”. It is not up to the citizens of Nova Scotia to define what “fracking” is. It is the responsibility of the government to define this term before any discussion takes place.

My personal definition of “fracking” is the process of “slickwater fracking”, in which water, sand and chemicals (“fracking” fluids) are forced underground under great pressure, to split open the rocks to release either oil or gas. Do you agree with my definition?

2) The review is not open and transparent or independent (“at arms length”). It is being set up to be totally controlled by the government and industry.

3) The citizen experts, who have done all the research and have educated themselves on all aspects of oil and gas exploration, development and “fracking”, and who have been writing thousands of letters on this topic for the past year, are being set up to be totally ignored.
4) The input from the citizens is meaningless as it appears it will be discounted as the government is going to call its own experts and will be guided by the civil servants who work in the Energy Department.

These people, are, (in my experience, on speaking to them), ex "oil-patch" employees who are biased in favour of the oil and gas industry and who feel that "fracking" is totally safe.

5) The department of energy appears to be in a conflict of interest situation as it is both the regulator and the promoter of oil and gas development, including the process of "fracking".

6) There are no guidelines in the Nova Scotia legislation and regulations concerning "fracking" – in fact, these old laws completely disregard the rights of citizens, animals and the environment, and appear to be in favour of the oil and gas companies.

It is my opinion that the legislation on oil and gas exploration and extraction and "fracking" should be scrapped and re-written.

7) "Fracking" with sand and water was done in the 1940's. In the past 10 years, on-going experimentation using "slickwater fracking" with dangerous chemicals continues. The "fracking" process can use any combination of chemicals as this is not an exact science.

8) The review proposes to study other jurisdictions and "best practices". The implication is that "it's a done deal" and it appears that the industry will come up with regulations that suit them and that all the provincial governments will sign on and have the same regulations, (including the powerful energy hub to the USA, New Brunswick), in order to present a consistent "standard" as a sop for the people.
9) You have limited the “scope” of this review to the effects of “fracking” on drinking water. Here is a list of other concerns:

1. Effects on groundwater, lakes and streams. (The health of salmon and trout, eagles etc.)

2. Use and effects on surface water and the sea. (acidification)

3. Impacts on land, such as potential soil contamination

4. Impacts on air from off-gassing.

5. Impacts on health of humans, animals, fish plants and trees.

6. The destruction of the natural environment when access roads and drilling pads and pipelines are built with heavy equipment. Loss of habitat for wild animals.

4. Waste management, including surface pits of “produced” water. Where will this heavily-polluted water and waste be cleaned or stored? In Debert or in Quebec? Or will the tax payers have to build a water treatment plant for this un-useable water in Nova Scotia? How much will this cost to build? What happens to the final product?

5. As millions of gallons of water are used up in “fracking”, how does the government plan to assure the citizens that they will have clean water to use in their homes and in agriculture in the future? We need a water assessment and management plan in Nova Scotia.

5. Can the government ensure that chemicals put in the ground and removed from the ground (used in hydraulic fracturing fluids), will not cause problems in years to come? It is unlikely that government lawyers would approve statements made by the government on this topic.

6. Site restoration. How much money does the company have to provide for the clean-up of each project? Who decides what is enough? Does the government remember what it cost to clean up the tar ponds?

7. What is the appropriate financial security / insurance that operators are required to provide, prior to conducting activity in the province?

8. Does the province have any awareness of what the health care costs and the costs of providing clean water to those people who lose their water would be?

9. Is the government aware that tourism, our province’s primary industry, will be negatively affected if oil and gas exploration goes ahead? Can the government afford to financially-support those people who normally earn their money through the
tourism industry?

10) The government of Nova Scotia has been surprised by the number of emails, letters and phone calls from a normally-complacent populace over the past one year. Instead of doing what the citizens are asking, (ie to ban "fracking" in Nova Scotia), the government is setting up a "red herring" of the "fracking" review, to distract the people into thinking that this will solve all the problems and answer all the questions.

11) The government should ask the question - Do the citizens want the process of "fracking" to be done in our province, or not? How many letters of support for "fracking" does the government get, in comparison to the numbers of letters against this practice?

I believe that the answer is already clear, taking into account the response of the people at the meetings in East Lake Ainslie and in Waycobah First Nation.

I urge you to listen to what the voters and taxpayers are saying, scrap this meaningless review and focus on the development of self-sufficiency in alternative energy production in small neighbourhoods, and in energy conservation.

Yours faithfully,

Frances Oommen

PS Why should the government of Nova Scotia, which is elected to serve the citizens, sell off oil and gas to companies who want to make money selling Canadian energy to the USA?

The government of Nova Scotia knows that the citizens will have to provide money for "externalities" to support this "business plan", and the government also knows that the citizens' money will be needed for clean-up of the mess that these companies will leave behind after they have drained us dry and leave with the profits.
And what about the costs of health care as people develop lung, skin and endocrine problems and cancer?
June 1, 2011

Dear Madam/Sir, frac-review@gov.ns.ca

I am writing about the scope of the review on “fracking” as proposed by the Nova Scotia government.

I am concerned by the limited scope of the review for the following reasons.

1) The government has not given a definition of what it means by “fracking”. It is not up to the citizens of Nova Scotia to define what “fracking” is. It is the responsibility of the government to define this term before any discussion takes place.

   My personal definition of “fracking” is the process of “slickwater fracking”, in which water, sand and chemicals ("fracking" fluids) are forced underground under great pressure, to split open the rocks to release either oil or gas. Do you agree with my definition?

2) The review is not open and transparent or independent ("at arms length"). It is being set up to be totally controlled by the government and industry.

3) The citizen experts, who have done all the research and have educated themselves on all aspects of oil and gas exploration, development and “fracking”, and who have been writing thousands of letters on this topic for the past year, are being set up to be totally ignored.

4) The input from the citizens is meaningless as it appears it will be discounted as the government is going to call its own experts and will be guided by the civil servants who work in the Energy Department.

   These people, are, (in my experience, on speaking to them), ex “oil-patch” employees who are biased in favour of the oil and gas industry and who feel that “fracking” is totally safe.
5) The department of energy appears to be in a conflict of interest situation as it is both the regulator and the promoter of oil and gas development, including the process of “fracking”.

6) There are no guidelines in the Nova Scotia legislation and regulations concerning “fracking” – in fact, these old laws completely disregard the rights of citizens, animals and the environment, and appear to be in favour of the oil and gas companies.

   *It is my opinion that the legislation on oil and gas exploration and extraction and “fracking” should be scrapped and re-written.*

7) “Fracking” with sand and water was done in the 1940’s. In the past 10 years, on-going experimentation using “slickwater fracking” with dangerous chemicals continues. The “fracking” process can use any combination of chemicals as this is not an exact science.

8) The review proposes to study other jurisdictions and “best practices”. The implication is that “it’s a done deal” and it appears that the industry will come up with regulations that suit them and that all the provincial governments will sign on and have the same regulations, (including the powerful energy hub to the USA, New Brunswick), in order to present a consistent “standard” as a sop for the people.

9) You have limited the “scope” of this review to the effects of “fracking” on drinking water. Here is a list of other concerns:

   1. Effects on groundwater, lakes and streams. (The health of salmon and trout, eagles etc.)
   2. Use and effects on surface water and the sea. (acidification)
   3. Impacts on land, such as potential soil contamination
   4. Impacts on air from off-gassing.
   5. Impacts on health of humans, animals, fish plants and trees.
   6. The destruction of the natural environment when access roads and drilling pads and pipelines are built with heavy equipment. Loss of habitat for wild animals.
   4. Waste management, including surface pits of “produced” water. Where will this heavily-polluted water and waste be cleaned or stored? In Debert or in Quebec? Or will
the tax payers have to build a water treatment plant for this un-useable water in Nova Scotia? How much will this cost to build? What happens to the final product?
5. As millions of gallons of water are used up in "fracking", how does the government plan to assure the citizens that they will have clean water to use in their homes and in agriculture in the future? We need a water assessment and management plan in Nova Scotia.
6. Can the government ensure that chemicals put in the ground and removed from the ground (used in hydraulic fracturing fluids), will not cause problems in years to come? It is unlikely that government lawyers would approve statements made by the government on this topic.
6. Site restoration. How much money does the company have to provide for the clean-up of each project? Who decides what is enough? Does the government remember what it cost to clean up the tar ponds?
7. What is the appropriate financial security / insurance that operators are required to provide, prior to conducting activity in the province?
8. Does the province have any awareness of what the health care costs and the costs of providing clean water to those people who lose their water would be?
9. Is the government aware that tourism, our province’s primary industry, will be negatively affected if oil and gas exploration goes ahead? Can the government afford to financially-support those people who normally earn their money through the tourism industry?

10) The government of Nova Scotia has been surprised by the number of emails, letters and phone calls from a normally-complacent populace over the past one year. Instead of doing what the citizens are asking, (ie to ban "fracking" in Nova Scotia), the government is setting up a "red herring" of the "fracking" review, to distract the people into thinking that this will solve all the problems and answer all the questions.

11) The government should ask the question – Do the citizens want the process of "fracking" to be done in our province, or not? How many letters of support for "fracking" does the government get, in comparison to the numbers of letters against this practice?

I believe that the answer is already clear, taking into account the response of the people at the meetings in East Lake Ainslie and in Waycobah First Nation.

I urge you to listen to what the voters and taxpayers are saying, scrap this meaningless review and focus on the development of self-sufficiency in alternative energy production in small neighbourhoods, and in energy conservation.
Yours faithfully,

PS Why should the government of Nova Scotia, which is elected to serve the citizens, sell off oil and gas to companies who want to make money selling Canadian energy to the USA?

The government of Nova Scotia knows that the citizens will have to provide money for “externalities” to support this “business plan”, and the government also knows that the citizens’ money will be needed for clean-up of the mess that these companies will leave behind after they have drained us dry and leave with the profits.

And what about the costs of health care as people develop lung, skin and endocrine problems and cancer?
From: <frac-review@gov.ns.ca>
To: 6/2/2011 6:44 AM
Subject: The Lake Ainslie Bloc

Good day.
I am writing to voice my concerns about drilling for oil and natural gas in the Lake Ainslie area.
As a resident of Lake Ainslie since I have enjoyed the pristine water of the Lake for its recreational value. We depend on ground water for water in our home as do 100% of the people outside of the communities of Inverness and Whycocomagh. To allow exploration for oil in such a fragile and sensitive environment is unconscionable. Worse, if oil or gas is found in commercial quantities, allowing development of an oil field would guarantee that many properties would lose their ground water and thus become uninhabitable.
Thank you for hearing my concerns.

Sincerely,

William McCarthy
From: Marion Moore
To: <frac-review@gov.ns.ca>
CC: 
Date: 6/2/2011 8:51 AM
Subject: submission re: fracking review

Dear Team of Senior Technical and Policy Staff,

My name is Marion Moore. I live in Although this area is not one of the parts of Nova Scotia that is being considered for hydraulic fracturing, I have been following the concerns of people in other parts of the province.

In all the reading I have done, one thing is clear to me. Not a lot is known about the long term dangers and effects of fracking. The federal government and provincial governments have yet to establish regulations and safety standards that would protect people and drinking water sources. While natural gas is often referred to as a transition step away from more energy-intensive oil, fracking for "unconventional" gas – gas that is difficult to get to – is not a climate solution. Any energy resource that sacrifices water protection and threatens people's health and environmental safety in such significant ways should be halted.

Nova Scotia has made commitments to move towards increasing our use of renewable energy. I urge the government to live up to these promises by putting resources toward finding solutions that are sustainable, encourage energy conservation and are known to be safe.

I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Marion Moore
From: "Maggie Herbert"
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 9:10 AM
Subject: Fracking in Nova Scotia

Dear Minister, Deputy Minister, Assistant Deputy Minister, engineers, technologists and team members,

I am a year-round resident of North Lake Ainslie, Inverness County, about 20 km by road but 5 km "as the crow flies" from the proposed drilling site on the shores of Lake Ainslie. I am terrified that there will be an oil well drilled on the shores of this lake, part of a Heritage River System. I am even more terrified that, should there be some evidence of oil, but not a great quantity, hydraulic fracturing (fracking) might be used to try to increase commercial output.

From ice-out to freeze up, I use Lake Ainslie almost daily, mainly kayaking and windsurfing, with a bit of fishing and swimming. We use water from the spring on our property for drinking and other household needs. If the lake water or ground water were contaminated with one of the many undisclosed 'fracking' chemicals, it would mean a personal disaster for my family's lifestyle and a financial disaster if I were to have to move and try to sell my now-valueless property.

The land and waters of the province of Nova Scotia is too precious to waste. Ban the process of hydraulic fracturing now. I believe we should spend our resources in improving alternate energy technologies as well as improving the cleaning and usability of our high-sulphur coal so that NS Power could use NS coal. At least that would mean jobs!

Sincerely,

Margaret C Herbert
From: Herb Gamberg
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 11:10 AM
Subject: fracking

Dear Review Staff,

We are writing to oppose any thoughts of hydraulic fracturing in Nova Scotia. The record of the results of this process is clear and well-known, and leads to unequivocal conclusions, which are vividly portrayed in the widely seen documentary "Gasland." The film shows a host of fracking activities on the continent and their tragic and disastrous consequences.

Fracking requires vast quantities of water and numerous carcinogenic chemicals. These create toxic effects in the water, soil and air, and eventually humans and animals. Unknowing landowners have seen their land, their livelihoods and their lives threatened and undermined by fracking. The information in this film is widely corroborated by many scientific studies on the subject. In a way, we are surprised that this is even an issue in Nova Scotia.

We urge your review to do its public service by helping to prohibit and thus end this inhuman process.

Sincerely,
Ruth and Herb Gamberg
From: Michael Bradfield
To: <frac-review@gov.ns.ca>
CC: <groundwater@ecologyaction.ca>
Date: 6/2/2011 11:11 AM
Subject: Fracking Review

Dear Review Committee

In more than 40 years as an activist and as a Dalhousie Economics professor - teaching, researching, consulting and working with community groups on economic development - I have become convinced that sustainable (environmentally, socially, economically, even politically) development occurs when it is built on small (at least initially), local projects. As with the environment, the economy must be treated as a web, not a chain.

Fracking, as a means to deal with our self-induced energy problems, is simply another example of looking for a technical solution as a quick fix. It involves disturbing physical systems which are incompletely understood and imposing the risks on people and communities who are neither part of the decision-making nor significant beneficiaries of the products and profits generated.

Fracking cannot be seen as feasible until extensive research is undertaken and until a variety of other solutions to our energy problems have been implemented, starting with more efficient use of energy.

I hope that your review process will include extended public consultations to stimulate broad discussion of the issues and greater transparency and faith in the process. Industry assurances that every contingency has been taken care of cannot be trusted - it is in their financial interest for your committee to believe that, but not in the interests of Nova Scotia's people and environment or of good decision-making.

Good luck in this very important process.

Yours truly

Michael Bradfield
From: "Ashraf Mahtab"
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 11:35 AM
Subject: Letter of comment regarding the practice of "fracking"
Attachments: Gov.let 2June2011.doc

To whom it may concern:

Attached is our letter of comments on the issue of Hydraulic Fracturing in Nova Scotia. Thank you for the opportunity for us to submit these comments.
Ashraf and Carol Mahtab
June 2, 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442, Halifax, NS, B3J 2P8

By e-mail: frac-review@gov.ns.ca

We would like to express our principal concerns regarding the potentially irreparable damage to the water regime that can be caused by producing gas from shale by using hydraulic fracturing, called “fracking”. The following points support our position:

- The water regime in most landmass is composed of surface water (including lakes, rivers, streams and brooks, etc.) and underground aquifers, which include underground ponds and water stored in naturally fractured rock. These bodies of water can easily interconnect by intrusions from well drilling and other events such as surface and underground mining, including fracking.
- Any pollutants resulting from the shale-fracking activity will enter into the water regime by gravitational flow.
- To date, there is no plausible technique that can prevent the spread and the eventual effects of the pollutants created by the practice of fracking.
- The suggestion from the industry that all potential damages will be mitigated is completely illogical. This point is confirmed by the May 14 issue of “The Economist”, in the article entitled “The need to be seen to be clean”, which states “A study led by Robert Howarth of Cornell University found that greenhouse-gas emissions over the life cycle of natural-gas production could actually be considerably higher than those of coal per unit of energy provided.”

Before any further activity concerning fracking takes place, we charge you, our Government, to undertake a Strategic Environmental Assessment to address the whole picture of shale gas development in Nova Scotia. In our opinion, this would be the only prudent path to follow. The gas will remain in place, gathering value and the citizens of the Province will remain secure until the extraction methods are proved to be safe.

Very sincerely,

Ashraf and Carol Mahtab
From: Michael Bawtree
To: <frac-review@gov.ns.ca>
CC: <premier@gov.ns.ca>, <educmin@gov.ns.ca>
Date: 6/2/2011 11:40 AM
Subject: no to fracking

Dear Review Committee and the NDP government of Nova Scotia,
I would like to join my voice to those calling for a complete embargo on
fracking in Nova Scotia, and am shocked to hear that some licenses have
already been granted. What was the point of voting for an NDP provincial
government if it does not stand up to the pressure from greedy oil and gas
companies to destroy our environment in this way? We don’t want or need to
set up our own version of the criminal Tar Sands activity in Alberta. Surely
you see it this way too.
We in the Annapolis Valley are amazed and outraged to learn that a potential
fracking zone has been marked between Wolfville and Windsor. Please read the
literature about the historic destruction of beautiful and fruitful
countryside in order to extract dirty fuels.
Thank you:
Michael Bawtree
From: Pamela Ackerman  
To: <frac-review@gov.ns.ca>  
CC: <ddexter.mla@gmail.com>, <ramonajennexmla@bellaliant.com>, <charlieparke...  
Date: 6/2/2011 11:42 AM  
Subject: HYDRAULIC FRACTURING

TO ALL OF YOU,

I CANNOT BELIEVE I AM WRITING THIS LETTER TO WHOM I HOPE ARE REASONABLY INTELLIGENT PEOPLE.

FORGET THE SO-CALLED "EXPERTS" AND THE CORPORATE SCIENTISTS, AND TRY TO SEE THE CORPORATIONS FOR THE UNCONSCIONABLE BANDITS THEY ARE.

SIMPLE COMMON SENSE TELLS US THAT FORCING WATER LOADED WITH TOXIC AND CARCINOGENIC CHEMICALS DEEP UNDERGROUND COULD ABSOLUTELY DESTROY WATER SUPPLIES COMING FROM WHO KNOWS WHERE. HUGE AQUIFERS COULD BE PERMANENTLY FOULED....... AND LAKES .... AND RIVERS. NOT TO MENTION THE RADON GAS AND METHANE THAT WILL BE BROUGHT TO THE SURFACE WHEN THE POLLUTED WATER IS RECOVERED.

FRESH WATER IS AN UNBELIEVABLY FRAGILE AND PRECIOUS RESOURCE. MESSING WITH IT IN THIS WAY IS INSANE!!!!

WHAT IS THE MATTER WITH PEOPLE? IS ANOTHER FOSSIL FUEL WORTH THIS KIND OF WHOLESALE DESTRUCTION? A FUTURE OF POISON WATER? SPEND EVERY PENNY YOU CAN TO SUBSIDIZE SOLAR AND WIND AND HYDRO POWER, BUT PLEASE GET TOUGH ON THIS ONE, AND SAY NO. -- LOUD AND CLEAR.

THANK YOU,

PAMELA ACKERMAN
From: Lou Bilek
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 6/2/2011 11:59 AM

Technical and Policy Staff,

My name is Lou Bilek. I want the N.S. government to ban hydraulic fracturing for the foreseeable future. There is a plenty of evidence that we do not have enough scientific (predictive) capacity to risks our environment.
Respectfully,
L. J. Bilek, Pae. D.
From: Adrianna MacKenzie
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 12:22 PM
Subject: Hydraulic Fracturing Study/Review

Dear Team of Senior Technical and Policy Staff,

My name is Adrianna

I feel lucky to have the luxury of turning on a tap when I want a drink because I am thirsty or a shower when I want to clean.

I am submitting comments relating to the province's review of hydraulic fracturing. Fracking threatens the quality of my water. I want the government to take fracking very seriously, and also consider banning the process completely.

Effects on groundwater: In many parts of the world people do not have the luxury of healthy safe drinking water at the turn of a tap. It appalls me that we would even consider a mining practice that would jeopardize not only our clean drinking, swimming, eating water. Who will benefit from this practice. The effects on our groundwater should not be outweighed by profit and gas.

Impacts on land, such as potential soil contamination: Our communities in the last several years have started to real education and promote the ideas of supporting local farmers and businesses by buying local, eating local and supporting our own economy. This has a positive effect on the environment if our food does not travel as far and local produces get a better rate for the food they produce. Fracking puts our land and soil at risk putting at risk our local economy and the strives we have been making towards a sound community approach to food. Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Adrianna MacKenzie

"Our deepest fear is not that we are inadequate. Our deepest fear is that we are powerful beyond measure.

It is our light not our darkness that most frightens us......"

- Marianne Williamson
From: Dan Hutt
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 1:24 PM
Subject: Comments for Hydraulic Fracturing Study

Dear Study members,

I would like to offer the following opinions on the hydraulic fracturing or "fracking" process and its potential negative environmental impact on Nova Scotia.

Numerous reliable university and Environmental Protection Agency studies have linked fracking with degraded drinking water. In some case in the US domestic well water was rendered unusable by fracking. In my opinion water is a resource that is enormously more valuable than natural gas. Any extraction of gas that puts drinking water at risk is unacceptable.

I also submit that any contamination of aquifers with the chemicals used in fracking cannot be mitigated and will last a very long time - likely centuries. While I know there is no scientific evidence to back up this claim I am also confident that hydrogeologists would agree that it is likely correct. Therefore, risking long term contamination of our aquifers with chemicals for short-lived extraction of natural gas is not acceptable.

Please recommend that Nova Scotia be a fracking-free province.

Thank-you for this opportunity to submit my views.

Dan Hutt
From: Carole Langille
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 1:35 PM
Subject: re: comments on the fracking

Dear Team of Senior technical and Policy Staff,

My name is Carole Langille and I am submitting comments regarding the province's review of hydraulic fracturing. From the studies I've read, CBC radio interviews I've heard, and documentaries I've seen, I am aware of the polluting effects on groundwater that fracking has and the danger of soil contamination. After documented disasters from uranium mining and the meltdown of nuclear power plants, haven't we learned anything? Why risk the very thing we need to stay alive, clean water? Surely you see that profits and temporary jobs are not worth the great price of polluting our groundwater! We have enough scientific savvy to find a better way.

I beg you not to allow fracking in our province. The government must put the best interests of the people in the province first, otherwise, as John Lennon said, "How do you sleep at night?"

Sincerely,
Carole Langille
From: Irmgard Lipp
To: <frac-review@gov.ns.ca>, <premier@gov.ns.ca>, <energyminister@gov.ns.ca>
Date: 6/2/2011 3:23 PM
Subject: Frac Review
Attachments: Fracking June 2011.docx

Please, see the attached file

Thank you
Irmgard Lipp, Grafton
Dear Frac-Reviewers,

My name is Margrit Robinson; and I have a keen interest in the health of our environment, especially water. My whole family kayaks, canoes and swims regularly. I am fortunate to have safe drinking water from the Town which comes from a lake nearby. I have looked at the government website and I have researched a good bit looking into the practice of hydraulic fracturing to extract gas. Even present day “best practices” do not seem to guarantee the health of water, people, animals and fields around drill-wells using fracking. The ecological footprint of fracking for natural gas is considered so great that the gas is in the end no cleaner than burning coal.

Comments going through the suggested points:
1. Groundwater: the amounts of water required for fracking are astounding, from 16–90 mio. liters per well, repeated up to 16 times per well. Withdrawing groundwater for fracking has to lower the watertable and impact wells. It is suggested that saline aquifers could be used as a source – do we know where these are and how much water they contain? As far as I know NS does not have a provincial inventory map of aquifers, fresh or saline. In places where fracking is practiced, wells have been contaminated with methane (the closer to the drill-well, the more, think flaming water taps!) and chemicals from the fracking fluid. Re-use of water is mentioned – only 20-70% of fracking fluid is returned, a large range, requiring a huge amount to top up.

2. Surface water: chemical contamination of wells has been explained by spills of fracking fluid even in areas where the drillers use solid steel pipes with surrounding concrete; maybe “best practices” are not good enough yet. Whether any of the chemicals are making their way up from fractured shale has not been studied enough – the methane make sit why not the chemicals? Chemical contamination on the surface runs into streams and lakes.

3. Impact on land, soil: drilling wells, collecting stations, pipelines, holding ponds, access roads all use up land. Do we want to give up forested or agricultural land for a resource that is no cleaner than coal in the end? Chemical contamination from spills or evaporators, if used, can make the land unusable for agriculture, even unsafe for children to play on.

4. Waste management: surface ponds of ‘produced water’ are toxic pits, maybe lined toxic pits, seepage is a concern; if sprayed out to concentrate the fluid for further disposal, the toxic chemicals end up in the surroundings – hardly a safe practice. A plan to “bury” the ‘produced water’ underground is problematic – where is it stored until a cavity is found? If it goes back into the fractured well, the same questions as before arise, like seepage up etc.

5. Identification and management of additives: 8-900 different chemicals are used to be added to the fracking fluid; even if chemicals only make up 1% of the fluid, a minimum of 1.6 mio liters of chemicals per well, this is an astounding amount of chemicals, many of which are proven carcinogens and neurotoxins with many not identified and not proven to be safe. Some of these chemicals have been found in wells close to drill-wells after drilling had started and they were only found then although the well had been used for decades before that. The list of additives has to be declared, not kept secret by the industry. The chemicals have to be studied for effects on people, animals and land and water. A lot more studies are needed.

6. Site restoration: as with quarries and mines a large enough restoration budget will have to be in place before any drilling is taking place, even exploratory drilling. This has to include remediation for any environmental damage concerning people, animals, vegetation and land use.
At the moment the fracking practices are not safe, not studied enough, not ecologically sane – a moratorium is called for. When more is known, the next step would be a Strategic Environmental Assessment that will be valid for the whole Province.

Also, should the moratorium be lifted in the future, a more extensive, transparent public consultation should be carried out; such an important and not well known issue deserves it.

Thank you for the opportunity to express my thoughts.

Margrit Robinson,
From: Thom Oommen
To: <frac-review@gov.ns.ca>
Date: 6/2/2011 8:15 PM
Subject: Feedback

Dear Fracking Review,

I'm writing with some comments for your review of hydraulic fracturing (fracking). I'm skeptical that my concerns will be used in any meaningful way. The scope of your review is limited to studying other jurisdictions and best practices. Therefore your review presumes that fracking will take place in Nova Scotia from the outset, perhaps with regulations. The people do not want this risky technique used in Nova Scotia (bearing in mind that wells have already been fracked in the Windsor Block).

The review is being undertaken by a team of policy and technical staff. Given that many Department of Energy team members have backgrounds in the oil and gas industry I dispute their impartiality. Even the Deputy Minister of the Department of Environment comes from the oil and gas industry. These realities do not fill the public with confidence.

Therefore your review lacks independent (non-government/industry) voices to ask the tough questions and hold you to account.

While your review focuses on fracking's many potential impacts on water, fracking is a much more complex issue. Below are some ways you must widen the scope of the study:

- Air quality has been shown to decrease significantly around drill sites and condensate tanks. The amount of air pollutants can impact human, not to mention other animals', health through constant exposure. Brain damage is common amongst those living in the shadow of fracking sites.

- Methane is a powerful greenhouse gas. Burning natural gas contributes to climate change even if it's better than coal. Shale gas is sequestered forever. Why release and burn it? Why not choose conservation and reduction instead?

- Nova Scotia is a popular tourist destination. Tourism generates millions of dollars in economic activity. If Nova Scotia pursues fracking, tourists are going to notice. Big rigs hauling toxic chemicals and pumping water out of lakes and rivers and eagles perched on drill rigs don’t make for the perfect vacation the government seeks to encourage.

- As we invest in more oil and gas and particularly fracking, the fisheries have the potential to be impacted. A spill of fracking fluid or rupture in a tailings pond could decimate waterways and fisheries.

- Fracking deep underground releases radioactive elements and brings them to the surface. This has been well documented. Radioactive materials are hazardous to say the least and cause cancer. What impacts could the introduction of these radioactive materials have on public health and government expenses?

- Fracking has been linked to increased seismic activity (earthquakes) in at least two locations around the world. How will increased
seismic activity impact Nova Scotia?

- The North American Free Trade Agreement obliges signatories to maintain trade levels over time. So if Canada sends 50 tonnes of widgets to the United States we must maintain this over time. If Nova Scotia sells our limited shale gas to the United States or Mexico are we committed to do so indefinitely? Will this impact our ability to make decisions on future drilling?

As you can see a more systematic and thorough review is needed to address the many, complex issues associated with fracking. A strategic environmental assessment may be an option instead of this review. Clearly though the review as it stands is not enough in the face of all these realities.

On a personal note, I’m about to become a father and I live in the Ainslie Block. The health of my child is the most important thing in the world to me and my wife. I have deep concerns with the proposed oil and gas exploration risking my child’s health in the short and long term. The fact that Petroworth Resources has not ruled out fracking demonstrates that profits come before public health. For all Nova Scotia’s children and their children’s children we must ban fracking in our beautiful province.

I am at your disposal to expand on these points though I do remind you again that Nova Scotians are clear that we don’t want fracking in our province. We want government to ban the practice as they wisely did with uranium mining. Don’t even waste your time with a review. The potential benefits of fracking (mostly income generation) are far outweighed by all the risks and hidden costs that will ultimately be borne by the taxpayer and future generations.

Sincerely,

Thom Oommen
FRIDAY, JUNE 3, 2011

TO: FRAC REVIEW, GOVERNMENT OF NOVA SCOTIA

I am attaching a copy of a letter we wish to submit for consideration during your review. Also, to prevent any transmission problems, we are printing the content of that letter below, just to safeguard from problems associated with attachments. This letter will also be forwarded to the appropriate Ministers.

Sincerely

Marilyn & Eugene Stanton

CONTENT OF LETTER:
FRIDAY, JUNE 3, 2011

TO: FRACKING REVIEW, PROVINCE OF NOVA SCOTIA

FROM: MARILYN & EUGENE STANTON,

DATE: JUNE 2, 2011-05-31

RE: HYDRAULIC FRACTURING AND/OR 'MANAGEMENT OF THE NATURAL GAS SECTOR''

My husband and I would like to add our voices to those who are already expressing concern about the potential evolution of the 'fracking' process. We are not part of an environmental group, nor do we live in
an area liable to be directly affected by this process during our lifetime. However, we are citizens of Nova Scotia and have always been happy to be considered as 'Maritimers' as we have a great love for the area.

We are in our seventies and have watched with mounting dismay the way that advancing technology has been brought to bear against the earth and the proliferation of government officials who have learned to deal with the 'unruly, interfering public' through the hiring of consultants and 'spin doctors', etc. etc. Two media releases from the New Brunswick and Nova Scotia Departments of Environment & Natural Resources on managing the natural gas sectors come to mind. In our opinion, one of the 'best' sentences from these two reports read: "He said that, since the province is very early in the exploration stage, the provincial government will take the time to get this right." Our mental translation of this equated to: "...don't worry little peons, be happy and free - we are looking after you!!" Further reassurances from MLA's and government critics calling for a 'proper monitoring & regulations' around the process make us shudder in horror of what past experience has led us to anticipate - that which could be unleashed upon us!!

When I was in grade five, our teacher was explaining about third world countries and how the governments of those countries, knowingly or unknowingly, worked against the people to use the land for economic gain. The example of the day had to do with something as innocuous as 'farming'. The teacher claimed the government confiscated the prime farm lands and grew crops that would result in high-priced, specialty cereals for our North American grocery stores. How could that happen we asked? She explained it was through clear-cutting/land processing and crop prioritization to the point where the people didn't have enough resources left to feed themselves and their families and the land was unable to protect itself from flooding. In my 10-yr-old arrogance, I thought Miss Grady was absolutely WRONG and I dismissed the analogy at the time. After all, how could a government not look after its own people, I asked myself. It has come to the forefront of my mind many times throughout the years but never more so than it does today!! Sixty years ago, Miss Grady was an 'environmentalist', before that was considered to be an unacceptable term with which to be tagged!

The ensuing sixty years has seen unbelievable advances in technology and mighty machines and process such as 'hydraulic fracturing' can be brought to bear against the hidden/buried resources of the earth. But those same technical advances have also occurred in the field of

'information technology'. The 'information highway' provided by the internet has brought us to the point where we no longer need to depend upon the insight/foresight of teachers like Miss Grady. Today, we can do our own investigative research and educate ourselves to the level where we comprehend both sides of an issue so that we can make up our own minds, and not be unduly swayed by the 'yea-sayers' or the 'nay-sayers'. We have read the Cornell Report, listened to the video provided by Prof. Anthony Ingraffea on the (potential dangers associated with) the Fracturing process; listened to the Environmental Groups, listened to CBC Information Programs, read the government department's reports, heard the Industry disclaimers about being the causative factor in releasing methane into the drinking supply, etc. etc. etc.

We come away from our self-imposed schooling on the subject, with the unshakeable conclusion on our part that proceeding down this technical path could be nothing but disastrous for the land and its people. We feel we must join with the environmentalists and call for a 'strategic environmental assessment' and a 'moratorium' until things are more clearly understood by ALL of us.
Actually, we would vote for an indefinite/almost forever moratorium, but that strong a position is not acceptable these days. We can only trust that common sense will prevail and not be diminished by greed on the part of government officials and/or Industry - whether it be to secure votes or merely to take advantage of antiquated laws protecting our land - or the lack thereof, in contributing to unjustified levels of shareholder's gains.

We are both signing this letter to show that there is not 'one voice speaking for two' but rather, 'two voices speaking as one'. Thank you for your consideration to our words.

Sincerely yours,

Marilyn Stanton

Eugene Stanton

c.c. Minister of Environment

Minister of Natural Resources
FRIDAY, JUNE 3, 2011

TO: FRACKING REVIEW, PROVINCE OF NOVA SCOTIA

FROM: MARILYN & EUGENE STANTON,

DATE: JUNE 2, 2011-05-31
RE: HYDRAULIC FRACTURING AND/OR ‘MANAGEMENT OF THE NATURAL GAS SECTOR”

My husband and I would like to add our voices to those who are already expressing concern about the potential evolution of the ‘fracking’ process. We are not part of an environmental group, nor do we live in an area liable to be directly affected by this process during our lifetime. However, we are citizens of Nova Scotia and have always been happy to be considered as ‘Maritimers’ as we have a great love for the area.

We are in our seventies and have watched with mounting dismay the way that advancing technology has been brought to bear against the earth and the proliferation of government officials who have learned to deal with the ‘unruly, interfering public’ through the hiring of consultants and ‘spin doctors’, etc. etc. Two media releases from the New Brunswick and Nova Scotia Departments of Environment & Natural Resources on managing the natural gas sectors come to mind. In our opinion, one of the ‘best’ sentences from these two reports read: “He said that, since the province is very early in the exploration stage, the provincial government will take the time to get this right.” Our mental translation of this equated to: “....don’t worry little peons, be happy and free – we are looking after you!!” Further reassurances from MLA’s and government critics calling for a ‘proper monitoring & regulations’ around the process make us shudder in horror of what past experience has led us to anticipate - that which could be unleashed upon us!!

When I was in grade five, our teacher was explaining about third world countries and how the governments of those countries, knowingly or unknowingly, worked against the people to use the land for economic gain. The example of the day had to do with something as innocuous as ‘farming’. The teacher claimed the government confiscated the prime farm lands and grew
crops that would result in high-priced, specialty cereals for our North American grocery stores. How could that happen we asked? She explained it was through clear-cutting/land processing and crop prioritization to the point where the people didn’t have enough resources left to feed themselves and their families and the land was unable to protect itself from flooding. In my 10-yr-old arrogance, I thought Miss Grady was absolutely WRONG and I dismissed the analogy at the time. After all, how could a government not look after its own people, I asked myself. It has come to the forefront of my mind many times throughout the years but never more so than it does today!! Sixty years ago, Miss Grady was an ‘environmentalist’, before that was considered to be an unacceptable term with which to be tagged!

The ensuing sixty years has seen unbelievable advances in technology and mighty machines and process such as ‘hydraulic fracturing’ can be brought to bear against the hidden/buried resources of the earth. But those same technical advances have also occurred in the field of ‘information technology’. The ‘information highway’ provided by the internet has brought us to the point where we no longer need to depend upon the insight/foresight of teachers like Miss Grady. Today, we can do our own investigative research and educate ourselves to the level where we comprehend both sides of an issue so that we can make up our own minds, and not be unduly swayed by the ‘yea-sayers’ or the ‘nay-sayers’. We have read the Cornell Report, listened to the video provided by Prof. Anthony Ingraffea on the (potential dangers associated with) the Fracturing process; listened to the Environmental Groups, listened to CBC Information Programs, read the government department’s reports, heard the Industry disclaimers about being the causative factor in releasing methane into the drinking supply, etc. etc. etc.

We come away from our self-imposed schooling on the subject, with the unshakeable conclusion on our part that proceeding down this technical path could be nothing but disastrous for the land and its people. We feel we must join with the environmentalists and call for a ‘strategic environmental assessment’ and a ‘moratorium’ until things are more clearly understood by ALL of us.

Actually, we would vote for an indefinite/almost forever moratorium, but that strong a position is not acceptable these days. We can only trust that common sense will prevail and not be diminished by greed on the part of government officials and/or Industry – whether it be to secure votes or merely to take advantage of antiquated laws protecting our land – or the lack thereof, in contributing to unjustified levels of shareholder’s gains.
We are both signing this letter to show that there is not ‘one voice speaking for two’ but rather, ‘two voices speaking as one’. Thank you for your consideration to our words.

Sincerely yours,

Marilyn Stanton

Eugene Stanton

c.c. Minister of Environment
    Minister of Natural Resources
Re: Hydraulic Fracturing Review

Like most rural Nova Scotian families, we are dependent on local ground water. Consequently, even the possibility that hydraulic fracturing might be permitted as a part of oil and gas exploration and extraction in this province is a matter of concern to me. I urge you to prohibit the practice on the following grounds:

1. Environmental - There is considerable evidence that fracking leads to contamination of groundwaters both near and some distance from the actual site of the fracturing exercise. Contamination can come from the chemicals used in the process and from the release of methane within the well itself. [See Stephen G. Osburn, Avnor Vengosh, Nathaniel R. Warner and Robert B. Jackson, 'Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing'. Proceedings of the National Academy of Science, May 9, 2011.]

2. Economic - To support fracking processes the Province would incur costs that would probably exceed the economic benefits. These costs would include improvement and maintenance of highways used by heavy trucks to transport the large quantities of water needed for the process. The costs of storing and rehabilitating whatever water which can be recovered must also be considered. Doubtless there are other infrastructure costs that the Province would incur.

It appears, as well, that the few benefits that flow from tapping shale gas are short-lived. Wells are soon exhausted; the companies move on, leaving contamination in their wake and an expensive clean-up operation to be carried out by local and provincial governments.

3. The Precautionary Principal - In March, 2009, the AGM of the NS NDP unanimously adopted an 'Environmental Framework' policy. The policy includes a commitment to avoid actions whose outcomes are unknown but might reasonably be thought to harm the environment (including public health). Surely this 'precautionary principal' should apply in this case. There is ample evidence that fracking causes pollution and some evidence that the chemicals used in the process are carcinogenic. [U.S. House of Representatives. Committee on Energy and Commerce. 'Chemicals used in hydraulic fracturing'. Washington, D.C., April, 2011.]

Admittedly, the public cannot assume that the policies of the NS NDP should be the same as those of an NDP government. Nevertheless the public is entitled to believe that an NDP government would strive to live up to the pre-election commitments of the Party and to be judged by the electorate in light of those commitments.

Paul Pross,
From: <frac-review@gov.ns.ca>
To: 
Date: 6/3/2011 8:52 AM
Subject: Submission on Scope of Fracking Review
Attachments: Govt Review on Fracking Letter.doc

attached
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442. Halifax, NS, B3J 2P8

By e-mail: frac-review@gov.ns.ca

My name is Ken Summers
with the other four Triangle wells within

There were a lot of questions when the company held its open houses for the community.
But they seemed to have all the answers and this was before any of us had heard of
hydraulic fracturing in the United States. Had the company been proposing a drilling
program now, I am certain they would have got an entirely different reception from us.

The N-14-A well is a few hundred metres from Noel Lake, and is within a designated
Department of Natural Resources wetland. Yet 85% of drilling fluids were not recovered.
With the typical percentages of chemical additives, that means tens of thousands of
hazardous wastes simply disappeared.

If I spill as little as one hundred litres of furnace oil, remediation is required. The reason
for those regulations is the potential contamination of groundwater- there is no waiting
for proof that the spill will harm groundwater.

But even with just a short track record of several wells drilled in Nova Scotia, hydraulic
fracturing has already loosed a magnitude of hundreds times more hazardous waste- into
a designated wetland no less. Yet the opposite principle applies as does to far smaller
furnace oil spills: it is an acceptable risk because the hazardous wastes “only” might
contaminate ground water.

Another major escape of drilling fluids, on a much larger scale, took place late last year
with Apache Canada’s horizontal bore fracking of the Frederick Brook Shale in New
Brunswick. In fact, Apache just announced that they are pulling out of the joint venture
completely. This company with deep experience in shale bed fracking has decided on
economic terms- let alone environmental concerns- that there are just too many unknowns
with drilling in Maritimes Basin shale beds.

I urge that the review seriously consider the merits of leaving the resource in the ground
at this point in time. It will be several years before gas prices even might rise high enough
that the province will earn any more than the marginal rents on the resource typical right
now. Not to mention that in areas new to it, the industry right now expects to get the
resource virtually without royalty cost. In several years the industry will also have been
pressed into improving its practices.

I am also very concerned about the greenhouse gas emission effects of the entire production process of hydraulic fracturing for gas. When the entire cycle is considered, there is no evidence that burning fracked gas for electricity production is any better than burning coal.

The states that regulate the industry in the US have refused to require the gathering of data on fugitive emissions in the production cycle, and the federal EPA has thus far not been allowed to gather the data. This will probably change in the near future, providing data that will give us a basis for making informed choices- another compelling reason not to rush to take a pause on development in Nova Scotia.

Our government needs to considerably expand the scope and time frame of this assessment beyond the stated review of technical literature and of so called industry “best practices.”

First it needs to be demonstrated that there is a single jurisdiction out there that has diligently assessed all the factors involved in hydraulic fracturing. All of the US state regulators have followed the industry’s lead: frack first, ask questions later (maybe).

Following the lead and the questionable track record of the US states and British Columbia is just not good enough for Nova Scotia.

Sincerely,

Ken Summers
From: CHRISTOPHER HOWSE
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 9:24 AM
Subject: Not satisfied.

This is not working for us. The North shore is worried, and this review is not helping. No where in this review are you asking whether or not hydro-fracking should be banned, so it is not good enough. Does this review include reviews of every risk? Long and short term? No. I am a new home owner. Are you considering the fall in property values? Heavy trucks running down this road 24/7 alone would be enough to effect the value of my property. What if one of these rigs is within sight of anyone's home? On the North shore everything is beautiful. That is why so many tourists get off the highway every year to visit the Tatamagouche area. It is worth the drive. What about our environment? The fishing is quite good here, but the salmon population is always fragile. The Waugh's River has recently been fitted with a new salmon ladder to help aid in their recovery. The Tatamagouche area alone has two large rivers that enter the Sea. Tatamagouche means, "Meeting of the waters." How quickly could this become a problem offshore fishing? Water, soil, and air pollution. Our wells... My future farm... Up in smoke. Health impacts. What about those? Cancer causing crap in my personal well. Jugs of water will not do. I know just how often these companies make mistakes, and they think that some water in plastic jugs or tanks makes up for it. It does not. Fresh air turned smelly and toxic. Why would we ever want to allow this anywhere?

Why isn't the public involved in this review? Why do a handful of suits hold Nova Scotia's future in their briefcases? I really do not know how it came to this, but I for one am very disappointed.

If fracking comes to this province, my girlfriend and I are leaving. Farewell to Nova Scotia.

-Christopher Neil John Gordon Howse
From: <trac-review@gov.ns.ca>, <frack_review@gov.ns.ca>
To: 6/3/2011 10:51 AM
Subject: submission from Ron Kelly

At first glance, NS may appear to be underdeveloped. History however tells us differently. Dating back to the time of exploration and settlement this province has undergone significant and permanent change. The forests have been cut an average of 7 times in most parts of the province. We are only now attempting to set aside 12% of the land base as 'natural'.

Development has its benefits but also costs.

In considering shale gas development, we MUST remember that our environment which is our life support system, has already been compromised, with resulting degradation of soil, air and water. The ecosystem can withstand some impact, however, the cumulative effects of additional environmental insults, such as fracking, must be taken into account - we are not starting with a “full pantry”. This perspective is always overlooked by proponents, and it is the responsibility therefore of the NDP government to take this into account.

We must look at the total ecology, the totality of impact on all life including trees, humans, lichen, soil, water, air etc.

I ask:
What are the particulars that inform us about shale formations in NS?
What would be the effects, short and long term, of chemicals used in fracking, on the soil, water and air, and therefore on flora, fauna and of course humans?
Exploration and drilling, with resulting road development, noise etc will further disrupt and fragment our ecosystem. NS already has more roads per capita than any other province in Canada, and yet more will be needed to accommodate this industrial activity.
When water, the basis of all life, becomes contaminated, what will that mean for wildlife who cannot drink “bottled water”?
When there are problems with spills and contamination, what will the costs be of remediation, if remediation is actually even possible?

When do we start to act wisely, using the Precautionary Principle?

In development proposals, there is the “do nothing” option. In an ecological way of thinking, we should use the “do nothing harmful” option when there are too many unanswered questions, where the risks are too high, and when citizens are against the development.

I sincerely hope that Nova Scotia does not pursue shale gas exploration. It CANNOT be safely regulated. The stakes are too high.

Ron Kelly
From: <frac-review@gov.ns.ca>, "Allan MacMaster" <macmasag@gov.ns.ca>, "Andrew...
To: 6/3/2011 11:55 AM
Date: Review
Subject: To Whom It May Concern,

The Council of Scientific Society Presidents—which represents 1.4 million scientists from more than 150 scientific disciplines - reported to the Obama administration in May 2010, "some energy bridges that are currently encouraged in the transition from GHG-emitting fossil energy systems have received adequate scientific analysis before implementation, and these may have greater GHG emissions and environmental costs than often appreciated." The development of unconventional gas from shale deposits, the Council warns, is an "example where policy has preceded adequate scientific study."

This warning delivered over a year ago to the US President should have attracted some attention in Nova Scotia, as it demolishes the baseless assumptions contained in the Provincial Energy Plan, that natural gas is a "transitional" fuel to a low carbon future. This assumption was never based on science, but rather, only a PR pitch from the fossil fuel industry. It is truly appalling that the absurd ideas forwarded by T. Boone Pickens, and a morally bankrupt fossil fuel industry would have been accepted as gospel with the government departments charged with preventing the exact sorts of damage that is part and parcel of unconventional natural gas development.

The entire shale gas industry has been based on simplistic, obviously flawed assumptions, which North American regulators should have recognized. Sadly it is not the only false assumption of this industry, it is however the key to the industries success in turning governments into co-conspirators with industry against the interests of their citizens and our environment. What was clear to science in May of 2010, received empirical support with the publication of the Robert Howarth Study, published in the peer review journal Climatic Change Letters.

http://www.eeb.cornell.edu/howarth/Howarth%20et%20al%20%202011.pdf. The Howarth study comes shortly after the US EPA doubled its estimates for escaping methane from hydraulic fracturing operations, and shows that though it is a gas bridge, unconventional sources of natural gas have 20% great impact on climate than burning coal. The lie that it is a bridge fuel is now clear as day, unconventional gas is a bridge to nowhere.

Another peer reviewed science journal, The Proceedings of the National Academy of Sciences published a study by Stephen Osborn et al. Duke University http://www.pnas.org/content/108/20/8067. Beyond showing a direct correlation between hydraulic fracturing and methane contamination of nearby (within 1 km) water wells, the fact that it occurs so routinely, shows that industry assumptions that leaks only happen from poor well construction are cast into disrepute. The study showed that the wells tested were contaminated with methane, and that the methane was NOT organic in nature, as industry shills would have. The Duke study supports the experience of the Quebec Ministry of Natural Resources, which found 19 out of 31 gas wells were leaking. http://www.cbc.ca/news/technology/story/2011/01/05/shale-quebec-bape.html

One of the study's authors was quoted in propublica, "We certainly didn't expect to see such a strong relationship between the concentration of methane in water and the nearest gas wells. That was a real surprise," said Robert Jackson, a biology professor at Duke and one of the report's authors http://www.propublica.org/article/scientific-study-links-flammable-drinking-water-to-fracking/single#republish.

In the spring of 2011 we now have what was missing when the province issued Gas and Oil Leases, peer reviewed science demonstrating that when it comes down to it, the gas industry has been oblivious to the damage they do, largely because they did bother to question their own rosy assumptions, and neither did the staff at the Nova Scotia Department of Energy, or the Nova Scotia Department of the Environment, whose approach to gas development has been typified by intentional ignorance. This "See No Evil" approach resulted in completely false statements and patronizing tone of the "Fact Sheet" accompanying the announcement of the review. The alleged "fact sheet" is nothing of the kind it is a political document with nothing but misleading assumptions. "We will continue to learn from the experiences of other jurisdictions, like British Columbia, Alberta and Saskatchewan, where they have successfully managed the regulation of hydraulic fracturing. Close to half a million wells have been hydraulically fractured in these three provinces with any incidents noted," That statement is truly appalling, as any attempt to fact check with Google would have shown numerous reports of fracking disasters dating back to December 2005 Edmonton Journal reported on damage to water supplies around Rosebud Alberta. The disinterest in the
consequences of fracking are well demonstrated since the CBC aired the documentary Burning Water, chronicling the destruction of Fiona and Peter Lauridson's ranching dreams from hydraulic fracturing [http://www.cbc.ca/documentaries/passionateeyeshowcase/2010/burningwater/] in October 2010.

Jessica Ernst of Rosebud Alberta has Hexavalentchromium (or Chromium-6) in her water. This past month launched a $30 million dollar lawsuit against Encana, the regulator, and the Alberta government. We can see the pattern of promoter/regulator, industry/government at work in Nova Scotia as well, where citizen concerns are ignored, and the Nova Scotia Department of Energy bends over backwards to assist the gas industry in keeping their leases, and act as a propaganda arm of the oil and gas industry against the interests of Nova Scotian's. Regarding Chromium-6, this is the same chemical that was the subject of the law suit which was popularized in the movie "Enri Brockovich". Ms. Brockovich is currently assisting 40 landowners in Midland Texas dealing with a Chromium-6 contaminating their water, from a fracking operation there [http://www.ernstversusencana.ca/].

British Columbia has also had reported incidents, 18 cases of fracking communication incidents were reported to the British Columbia Oil and Gas Commission. A communication incident is where fracking materials injected in one gas well, "pop up" in other gas wells. What is especially significant about the incidents, is that the fractures did not anticipate, or even think it possible, for the successful communication to occur, or else they would not have done it! The decade of fracking has shown time after time, that industries assumptions, down the line, are all wrong [http://theteye.ca/News/2010/10/15/FrackingDisaster/].

One of the horrors of hydraulic fracturing which you're review has not included, is the air quality issues. This is also a video of a compressor station shot in infrared, showing escaping gases. The day that a Huffington Post report on air quality issues from fracking in Wyoming, "Preliminary data show ozone levels last Wednesday got as high as 124 parts per billion. That's two-thirds higher than the Environmental Protection Agency’s maximum healthy limit of 75 parts per billion and above the worst day in Los Angeles all last year, 114 parts per billion, according to EPA records. Ozone levels in the basin reached 116 on March 1 and 104 on Saturday" [http://www.huffingtonpost.com/2011/03/08/wyoming-alt-pollution-gas-drilling_n_833027.html], The Howarth study also demonstrates that the smog generated from gas development can drift 200 miles. "Natural Gas Operations From a Public Health Perspective" will be published this fall in the International Journal of Human and Ecological Risk Assessment by Theo Colburn et al., examines the effects on air quality from not only fracking but other drilling activities [http://www.endocrinedisruption.com/files/Oct2011HERA10-48forweb3-3-11.pdf]. The study also provides a list of chemicals used and produced in drilling and fracking.

If the government is serious about reviewing the impacts of fracking, you should interview Dr. Anthony Ingraffea, he holds a PhD in Rock Fracture Mechanics. Dr. Ingraffea points out that fracking is really re-fracturing existing fractures, and that when the pressurized friction reducers reach a joint system, the joints open in unpredictable ways. Dr. Ingraffea also points out that despite industry's claim, that fracking is a sixty year old practice, that it's use in recovering unconventional gas is dependent on a series of technologies only developed in the past decade. Dr. Ingraffea also points out that, there is no stable state of fracturing technology, in other words the industry is constantly tweaking their methods and materials in response to the situation they encounter. This is the reason that there are so many different formulations of fracking fluids. "slickwater" fracking was first used in 1996, and since then formulations have been worked and reworked, with no regard for anything but production of gas. Workers performing maintenance on abandoned wells will have no idea what products were used in the frack.

Reading from page 12 of the Colburn study, "For many years, drillers have insisted that they do not use toxic chemicals to drill for gas, only guar gum, mud, and sand. While much attention is being given to chemicals used during fracking, our findings indicate that drilling chemicals can be equally, if not more dangerous. What we have learned about the chemicals used in the Crosby well blowout provides insight into why citizens living nearby suffered severe respiratory distress, nausea, and vomiting and had to be evacuated from their homes for several days. It might also shed light on why other individuals living near gas operations have experienced similar symptoms during the gas drilling phase (prior to fracking). From the first day the drill bit is inserted into the ground until the well is completed, toxic materials are introduced into the borehole and returned to the surface along with produced water and other extraction liquids. So the threat to public health exists even in the absence of "fracking".

Those "other extracted fluids" include an array of very toxic naturally occurring materials, which are unnaturally released into the environment by the fracking process. Chris Gobbel of the Michigan Department of Natural Resources, "The fluid chemistry and toxicity is really driven by the naturally
occurring chemicals that are coming up at toxic levels in the return flow, it brings up dissolved hydrocarbons, Benzene Thylene Ethylbenzene and Xylene isomers being then four typically focussed on. It brings up heavy metals, it can bring up radionuclides including Radium 225 and other naturally occurring materials that are at toxic levels at the surface, and of course you have the additives." Grobbels also mentions the air quality issues, "That means greenhouse gases, acid rain causing gases, asthma causing particulates are all associated with fracking". http://www.waterlink-international.com/news/id1297-Fracking_Water_Quality_Concerns.html

Newsweek Magazine August 20, 2008, carried a report on the effect of fracking fluids on emergency room nurse Cathy Behr. Behr was treating an injured gas worker, who's clothing had been splashed with fracking fluids, while other hospital staff initiated quarantine protocol. Two days later, Behr was admitted to Mercy Regional Medical ICU with erratic blood counts, swollen liver and lungs filling with fluid. Her doctors described her condition was "entirely consistent with exposure to all the information we were able to gather" (MDS Sheet for Zetaflow), http://www.newsweek.com/tag/cathy-behr.html

Another incident that attracted attention was in Avella Pennsylvania. Reported in Vanity Fair's Colossal Fracking Mess http://www.vanityfair.com/business/features/2010/06/fracking-in-pennsylvania-201006, a report of a wastewater impoundment that caught fire, and exploded, sending a 200 ft conflagration into the sky, which burned for six hours. An EPA accredited laboratory found arsenic at 6,430 times acceptable levels, and Tetrachloroethylene at 1,417 permissible levels.

I would also recommend reading Ben Parfitt's report for the Munk School, Fracture Lines http://beta.images.theglobeandmail.com/archive/00942/Fractured_Lines_942842a.pdf

As you will see, Mr. Parfitt makes numerous recommendations for actions aimed at monitoring the environmental consequences of fracking. Monitoring is not protecting, and what is increasingly clear, there is no protection from fracking's negative consequences.

I am greatly concerned by the behaviour of the company that the Nova Scotia Department of Energy has granted the Ainslie Block Lease. I have attended two presentations by company president Neal Mednick, and drilling supervisor Ed Ferco, regarding their plans for drilling on Lake Ainslie's western shore. Not only were they unaware of the legacy of fracking across North America, they were incredulous at the idea that gas and oil drilling could cause any problems at all. Mednick equated the risk of damaging Lake Ainslie as equal to the risk of a plane crashing in the Lake, a "one in a billion" chance. And, on both occasions, both gentlemen made numerous statements that were known to be untrue, demonstrating a dangerous combination of dishonesty and disinclination.

The government attitude isn't reassuring. The lease's name is that of Nova Scotia's largest freshwater lake, part of Nova Scotia's longest river system, recognized for its special environmental and cultural values as a Canadian Heritage River. Lake Ainslie supports an important local freshwater commercial fishery, and provincially important sport fishery, and feeds into the Margaree River with its international significant Salmon sports fishery. The area's economy is based on forestry, fishing, agriculture and tourism, all of which are incompatible with shale gas industry. Thousands of livelihoods are placed at risk from imposing heavy industry on this bucolic landscape.

Beyond the issuance of the lease, Department of Energy staff have acted as spokesmen for this industry, in the press and at public meetings, demonstrating a great lack of intellectual curiosity about the industry they ostensibly regulate. Requests for information are refused, with a referral to Petroworth. Even the announcement of this review gave the department further opportunity to propagandize with their unfact sheet, and absurdly claimed that there were no plans to frack, years after they issued the gas leases!

It is my great hope, that some honest, intelligent person may follow the links I have included, my great hope that someone somewhere in the system will act responsibly. Who ever you are, thank you for doing the right thing

Geoffrey May
From: Karen Olsson
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 12:17 PM
Subject: Fracking

Hello!
As a long time NDP supporter I am disappointed that the NDP government has not taken a much stronger stand on stopping fracki

--
"karen"

Karen Olsson
From: Richard Wurtz
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 1:26 PM
Subject: Hydraulic Fracturing

Dear Team of Senior Technical and Policy Staff:

I am writing to you because I am very concerned about any hydraulic fracturing that may be taking place in Nova Scotia. My name is Richard Wurtz, and this is a lovely rural part of Nova Scotia and the countryside and the quiet is one of the reasons we are here. We have our own well, and there is a small creek that borders our property.

I have seen the videos and photos of similar rural properties that were changed dramatically by the intense industrial process that is hydraulic fracturing. People who had lived for generations in the same place now saw it change to a horrible condition with polluted wells and streams. There is a tremendous amount of truck traffic that accompanies this process, so it changes the quiet rural scene into one of an industrial work site.

Even if I never wanted to have fracking done on my property, it doesn't stop one of my neighbours from doing it and completely changing and possibly ruining my quiet, my well and the creek.

I am submitting these comments because of the government's review of this process. I would like to see hydraulic fracturing banned here because of the many potential hazards that seem so inevitable. There needs to be a more transparent public consultation than just public comments.

Thank you for hearing my concerns. Please act responsibly for the citizens of Nova Scotia and keep in mind the long term health of the land as well as people instead of the short term monetary gain.

Richard Wurtz
From: Wilf Bean
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 1:43 PM
Subject: Submission to Hydraulic Fracturing Study

Hydraulic Fracturing Study

Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442 Halifax NS
B3J 2P8

Dear Friends:

*Submission on Hydraulic Fracturing Review:*

* *
* *

I thank you for inviting input into your deliberations on developing an adequate review process to consider Hydraulic Fracturing in Nova Scotia. I submit the following as some essential areas to be included. My input involves four areas, in no particular order:

* *
* *

*A) Environmental:*

Quality of our water is a very high concern:

- Groundwater and surface water – ensure there is an independent baseline survey prior to any activity so any changes can be adequately monitored

- Require an independent scientific assessment (payed by applicant) ensuring that to best of predictable ability, water levels will not be affected.

- Ensure that no toxic chemicals are introduced into the water system at any level. That is, ensure all chemicals introduced are identified and proven safe for human and other consumption. (Not only humans depend on our water system!)

Other Activity:

- In terms of surface activity, ensure that any surface disturbance (including all surface activity – drilling, waste water disposal, etc. etc.) is kept to a minimum and does not detrimentally affect local wildlife – deer, bear, migratory birds, etc. etc. Require detailed plans for how migratory birds will be kept from any toxic ponds, for example.

- Ensure detailed plans for full rehabilitation of the site when the activity is finished. Ensure there are financial guarantees that full
rehabilitation activity will be carried out by the applicant, even if this may be several years in the future, and the company may no longer exist!

- Ensure adequate backup containment/cleanup design is included as part of the application for the possibility for accidents, such as any toxins being released into the local eco-system.

- Ensure regular (daily?) ongoing monitoring of activities and sites by regulatory inspectors with power to shut down operation, if necessary, possibly along with contracted local citizen monitors.

I'm not an environmentalist, although I recognize that all life is inter-related, and am aware my list is incomplete. I assume, however, that an adequate approval process will require that an applicant submit an independent, public, comprehensive environmental impact study for all activities proposed in any particular area, alerting the regulator to any particular areas of environmental concern.

* * *

*B) Local Infrastructure:*

* *

As many emphasize, Nova Scotia is rightfully known for our natural beauty. This healthy natural beauty, along with our small coastal villages, and our rural lifestyle combine to make the quality of life here very high. Along the North Shore, this natural beauty is also the source of a thriving local tourism industry. There must be great concern for any activity which has the potential to degrade "Canada's Ocean Playground" as it would have impacts aesthetically, environmentally, and on the many incomes that are linked to local tourism.

I suggest therefore that any applications must include a detailed independent study of specific effects on local infrastructure, including:

- Effect of increased traffic on local roads – how many trucks, what weights, etc., plus how road system will be equipped for increased use. In Pugwash, Wallace, Tatamagouche, and River John, the highway goes through the centre of town and increased heavy truck traffic would be unacceptable. Increased truck traffic would require alternative routes. It would also be unacceptable that the taxpayer subsidize the costs of maintaining or improving infrastructure negatively impacted by fracking activity. In fairness, these costs would need to be borne by those making profit from the activity.

- Waste disposal sites – are they adequate? Who will provide them? Exactly how will waste be transported from drill sites to disposal sites? Again, what will be effect on local roads?

- What other local infrastructure will be affected? For example, will our local emergency health system be adequate to deal with emergency situations? Will such activity place increased demands on our local
health-care services generally, either by the applicants or by increased health concerns of local citizens? Will there be increased responsibilities for local fire departments? Police units?

- What positive and negative local economic outcomes will result from the activity? Will there be local jobs? Use of what local facilities? Which are short or long-term opportunities? Will there be “buy local” policies for locally-available goods?

*C) Citizen and Community Involvement*

Recognizing as we all do that a major, underlying purpose of considering these activities is to benefit Nova Scotians, how do we ensure affected local residents are given a maximum, informed opportunity to participate in deciding if the activity is in fact to our benefit? I suggest the following as some of the necessary process and guidelines:

- First, that the principle be stated that any local residents in the affected area will be invited into full, informed, collective involvement in helping make decisions PRIOR TO ANY APPROVAL.

Meaningful local participation requires informed discussion PRIOR TO any approval of permits. Therefore, an adequate process would require that any application be presented to the local community(ies), along with a critical review by an independent body. The independent body would include independent resource experts to review the technical aspects of the application. After the community has had the opportunity to consider both the application and the independent review, there would then be a community hearing through which community input – questions, comments, positions – would be welcomed for consideration prior to any approval. Some form of review panel – consisting of local and provincial government and independent resource experts would conduct the hearing process and ultimately decide if a permit were to be issued, and with what conditions. As a general principle, a project would not proceed if the community were clearly opposed.

- In the case of particular local questions or concerns not sufficiently addressed in the application, the panel might require that the applicant – or an independent body, depending on the concern – undertake further research to ensure questions which have arisen through this inquiry were adequately answered. I think we are well past the days of “trust the experts!” or “we’ll deal with that when we get there!”

*D) Larger Scope*

Hydraulic Fracking projects do not end when the shale is fracked. As I understand it, if adequate gas reserves are revealed, then a further stage will follow to transport this gas to market. Knowing this inevitable logic of the process, I suggest that any application must include consideration of the full impact of the project from initial fracking to final marketing and
rehabilitation of the site. If there is any possibility, for example, of pipeline construction, or of further truck traffic to transport the product to market, then this must be presented in the initial stage. In summary, the initial application must include detailed plans of how the applicant plans to deal with a successful project through to its full completion (gas to market) so that the full impact can be considered, as well as how to deal with an unsuccessful project (no marketable gas discovered) to return the site to an acceptable, rehabilitated state.

As well, part of the review at the provincial level, would include a full review of this project in comparison with other sources of energy. What are the risks and benefits – environmentally, socially, financially, short-term and longer-term – of encouraging fracking compared to greater encouragement of wind, solar, tidal power or other energy sources? As fossil fuels become scarcer, and their harvesting involves greater risk, at what point is it wiser to turn to other fuel sources, perhaps along with an increased program of energy conservation?

While this may be seen as beyond the scope for considering individual hydraulic fracking applications, it is part of the application framework which must be considered and clarified at the policy level to give guidance as to what levels of risk are acceptable or unacceptable. This overall provincial assessment of the cost-benefits of hydraulic fracking compared to cost-benefits of other energy sources would then also be available to a local community to provide a comprehensive context for deliberating on any local application for hydraulic fracking.

In summary, these are four areas of concern which I suggest must be included in developing guidelines for considering applications for hydraulic fracking in Nova Scotia.

Again, I thank you for inviting this input.

Wilf Bean PhD
From: Jennifer West <jennifer.j.west@gmail.com>
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 2:40 PM
Subject: Comments for Joint Review
Attachments: Comment, EAC.pdf

Please find attached, comments from the Ecology Action Centre for the joint review of hydraulic fracturing.

Jennifer West
June 2, 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
P.O. Box 442 Halifax NS
B3J 2P8

To Whom It May Concern,

On behalf of the Ecology Action Centre, we are writing to provide feedback on the provincial review of hydraulic fracturing ("fracking") soon to be undertaken. We appreciate the opportunity to comment on what has quickly escalated into an issue of primary concern for many Nova Scotians.

To begin, we wish to highlight a few key points that are currently absent from the scope proposed for the review. Remarks on the environmental focus areas identified for the review follow.

What's Missing

While the Draft Scope of the review states that it will "...examine the potential impacts of hydraulic fracturing in shale gas operations in the province" and "identify potential environmental issues", it is not structured to do either of these things. The review is structured to research regulatory approaches and best practices in other jurisdictions, and to present these alongside recommendations for Nova Scotia policy and practices. A review of regulatory mechanisms will not reveal the potential environmental and social ramifications of fracking in Nova Scotia. The review should be structured so that it can actually fulfill its stated intention. The Ecology Action Centre recommends using the model of a strategic environmental assessment to thoroughly review hydraulic fracturing in Nova Scotia. This should be undertaken under a moratorium of all fracking activities (exploration and production).

Responsible resource extraction and energy sector development are not addressed by this review. Natural gas is a non-renewable resource. Is it appropriate to allow exploitation of another of Nova Scotia's scarce resources using an aggressive extraction method potentially harmful to Nova Scotians? Will development of this resource help in achieving the energy targets set out in the Environmental Goals and Sustainable Prosperity Act? The review should answer these questions while exploring and comparing alternative opportunities for energy sector development in the province.

Royalties are not addressed by the proposed scope. Currently, exploration companies enjoy a royalty holiday for several years before they share profits with government. In many cases, shale gas production reduces by up to 50% after the first year, and reduces again in folowing years. Only in rare cases is production of shale gas from fracking sustained for several years, and it is not likely that the small reserve in Nova Scotia will be one of these cases. The traditional royalty system may not prove to have any financial benefits to the Province under these conditions. Is a grace period is maintained for the first two years, the province should consider mandating obligatory investments to an environmental emergency fund, effective community consultation and engagement, and rural infrastructure costs.
Air quality is not addressed by the review's current framework. Where fracking occurs, air quality is often compromised due to gas flaring, evaporating wastewater, exhaust from vehicle traffic, and other activities. Air quality monitoring stations should be installed near drill sites and should be monitored daily. When federal guidelines are exceeded, activities and vehicle traffic should be forced to cease, with an announcement made to nearby communities. Plans should be reorganized to reduce emissions and improve air quality.

Effective community consultation and engagement should also be a priority of the review. The scope should include a model and timeline for public engagement in the form of written submissions and townhall meetings. Using the model of strategic environmental assessment, communities, government and industry would collaborate and ensure the review is representative, transparent, and credible.

Specific Comments on the Proposed Environmental Scope of the Review:

1. Effects on groundwater

Funding for long term monitoring of groundwater should be a high priority of the province during this review. Although the province has a groundwater-monitoring network, it has very few density of wells and does not cover large areas, some of which has potential for hydraulic fracturing. The province must fund baseline monitoring of wells in potential fracturing areas, and also ensure long term monitoring of quality and quantity during and after fracking activities. Monitoring should assess the appropriate chemicals of concern at each site, at rates that consider their transport and persistence in the environment.

Chemicals used in fracking should be proven not to be toxic prior to and after mixing with other chemicals and water. There should be absolutely no toxins introduced into groundwater through fracking.

2. Use and effects on surface water

Fracking requires large volumes of water, which will be obtained from groundwater or surface water in Nova Scotia. Drinking water quantity and quality will be affected by this water removal. Existing water withdrawal regulations should be adjusted to account for the large volumes of water required for fracking. Although the existing groundwater withdrawal limit of 23 000 litres, which is a minute amount considering the scale of water required for fracking, it is not likely that groundwater would be the primary source of water for fracking activities. Fracking chemicals would likely be mixed with surface waters as they were in exploration fracking which occurred in Nova Scotia between 2007 and 2008. Surface waters are threatened, and they should be protected by fracking-specific regulations.

Storage of chemicals and wastewater on site could spill into nearby rivers and lakes. If fracking is allowed to occur in Nova Scotia, it is likely that accidents will occur either on well sites, on highways, or on rural roads near farmlands. The province must make a contingency plan, such as an environmental Super Fund, for these kinds of events to ensure a rapid and complete clean up.
3. Impacts on land, such as potential soil contamination

Water will be mixed with chemicals, which optimize capture and transport of natural gas. This fluid will be injected into the ground at high pressures to release natural gas from the rock, and commonly is not recovered. Lost fluids can travel through existing or newly created fractures, which have the potential to reach drinking water aquifers closer to the surface.

Using calculations from company-published online information, the amount of chemicals lost in a recent well in Nova Scotia may have contained more than 114,000 litres of chemicals. Compared to the provincial Domestic Fuel Oil Spill Policy, which triggers remediation for a spill of more than 100 litres of fuel oil, regulations must be in place that explicitly state the amount of water and chemicals which would trigger a complete halt in activities, followed by assessment, recapture and remediation.

4. Waste management, including surface ponds of produced waters

Surface ponds must not be permitted in any fracking activity. Storage ponds represent a serious risk of flooding under certain rainfall conditions, or given a release of containment walls. Storage of water mixed with chemicals that have been captured from fracked wells represents a risk of flooding and contamination. Additionally, air quality is compromised when produced waters are stored in surface ponds.

Injection of wastewater into deep wells is not an acceptable practice in Nova Scotia. Unless fluids are proven to contain no toxic materials, they should not be injected into deep geologic formations for disposal. Using deep geologic formation as “underground landfills” is not an acceptable practice because of the potential of fluids over time to migrate into drinking water resources.

5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids

As mentioned above, chemicals used in fracturing should be proven not to be toxic prior to and after mixing with other chemicals and water. Chemicals should be identified by their toxicity, interaction with other chemicals, interaction with existing organisms, interaction with all native geologic formations, and by their short and long-term effect on human health. If any of these effects are not known, or are deemed to be negative, the product should not be used in any fracking activity.

6. Site restoration

Drilling sites should be documented prior to any activities and returned to their original conditions after activities are completed. Long term monitoring should be required at every site, in the form of a three-dimensional network of monitoring wells which would capture conditions around the well, for a length of time that is appropriate for the chemicals used (e.g., half life, or time to biodegrade). Long term monitoring of any concerned citizen living in the area should be undertaken with the same detail and for the same length of time. The wells should be donated to the provincial monitoring network or to the Groundswell network for further long term monitoring, after meeting all water quality monitoring commitments.

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province
The province should establish an environmental fund that would be used in the event of a spill that is considered catastrophic to the environment or to our human health. The events surrounding the oil spill in the Gulf of Mexico shed light on the need for funds to be available for instant mobilization of equipment and manpower to contain substances, prevent spreading, and capture lost materials.

Thank you for your time and attention.

Sincerely,

Jennifer West  
Groundwater Coordinator  
Ecology Action Centre  
groundwater@ecologyaction.ca

Catherine Abreu  
Regional Facilitator  
Atlantic Canada Sustainable Energy Coalition  
acsec@ecologyaction.ca
From: Bev McLellan  
To: <frac-review@gov.ns.ca>  
Date: 6/3/2011 3:25 PM  
Subject: Fracking Nova Scotia

To Whom it May Concern;  
After reviewing some information on Fracking in Nova Scotia, I can not believe the government will allow this practice until a lot of research has been done. As far as I’m concerned this practice puts everyone and everything at risk. It could pollute our underground water supply, contaminate our soil which in turn will contaminate our food supply and environment. Our environment is in bad condition now, can’t we come up with a more environmental friendly way to provide the needs of our province.  
The companies should be held responsible for the cost of water testing (to be done by an independent company) and liable for any damage to our fragile ecosystem. We need to ensure that they don’t go bankrupt and leave the province and taxpayers with their debt, so sufficient monies need to be obtained prior to leases being granted.

Thank you for taking the time to listen to my concerns;  
Beverly McLellan

cc: Chuck Porter, Hants West MLA  
Andrew Younger, Liberal Environment/Energy Critic  
Allan MacMaster, Conservative Environment/Energy Critic
To Whom It Concerns:

First, let me say that I believe in the precautionary approach. Therefore hydraulic fracting should not be practiced until it can be determined beyond reasonable doubt that no harm will come of it to the environment, the infrastructure, and economic growth of Nova Scotia. The vast number of environmental disasters already reported from fracking around the world - methane in wells, sensitive environments disrupted for drilling and production, leaking well casings, pollution of ground water and deeper aquifers, use of large volumes of fresh water, and, now, earthquakes - shows that we are not able to do this procedure without damage.

That said, it must be noted that the recent American study at Duke found out that within a mile of a fracking site it is 17 times more likely to have methane in wells following the process.

There is a problem with waste water pollution.

We have been told that there are already horizontal fractures leading from offshore into the shale deposits. No studies have been done on the possibility that fracking could salinate the water table. No place in Nova Scotia is more than 40 km from the ocean.

Citizens who have had water source, environmental, and property damage due to exploration and fracking have been at a great disadvantage. Once water a water is gone or polluted, it is gone. There is nothing that replace it, for drinking, bathing, cooking, farm use. Therefore I propose that drilling and fracking entities, and the corporations that employ them, be required to do extensive testing of wells and ground water prior to exploration and fracking, and that these results be inferred to any non tested water. Further, when damage does occur, the disadvantage that land owners have dealing with large- often foreign- companies be held automatically responsible for damages, and that they provide assistance to the harmed parties in their actions seeking redress.

The economics of the shale gas development must be questioned as well. There has been no statement from government on where the gas will be used, and for what purpose. It is abundantly clear that extraction of a resource provides minimal benefits to a province, especially when the cost to infrastructure such as roads and ecological damage is concerned. There is no plan to do value add, or even to use the gas in the province or province. There is then, no expectation of economically benefiting from this gas than from off shore gas. It would be for the economic benefit of foreign companies and the New England market. I say leave the gas in the ground.
until we have figured how to get the maximum benefit for Nova Scotians. Its value will only increase, and the technology will improve while we wait.

Yours truly,

Paul Brison.
Dear Reviewers:

Please take this information into account as you consider whether the risks and dangers involved should lead to the prohibition of the fracking process in Nova Scotia, altogether.

Respectfully,

-Michele Kustudic

British authorities see link between fracking and quakes
https://secure.globeadvisor.com/servlet/ArticleNews/story/gam/20110602/RBBRTAINSHALEMCCARTHY
ATL

Thursday, June 2, 2011

SHAWN McCARTHY

OTTAWA -- GLOBAL ENERGY REPORTER
Already under fire over perceived threats to local water sources, the natural gas industry is facing a new challenge: earthquakes.
A small energy company halted its shale gas drilling and hydraulic fracturing program in Britain after two mild earthquakes were recorded in the vicinity, an area where such tremors are rare.
The rapid development of massive reserves of unconventional shale gas has transformed the North American energy industry, making abundant natural gas the fuel of choice for the electricity sector. Oil and gas companies that had planned to import liquefied natural gas are now looking at exporting surplus gas to Asia and other markets.
European countries are eager to replicate that shale gas boom. However, environmental issues threaten to stall development in Europe, even as U.S. states such as New York and Texas clash with Washington over federal regulation.
Now, the controversial drilling activity is being linked to earthquakes - first in Arkansas, where companies are developing the prolific Fayetteville play, and now at Britain’s first shale gas exploration site, near Blackpool in northwest England.
U.K.-based Cuadrilla Resources suspended its hydraulic fracturing - in which chemically laced water is injected at high pressure to crack gas-bearing rock - pending a review of seismic activity near its Preese Hall drilling site.
The British Geological Survey said it recorded a 1.5-magnitude earthquake on Friday. This followed a 2.3-magnitude quake in April, both near the drilling site operated by Cuadrilla. Neither caused any damage.

In a statement posted on its website, the BGS said evidence suggests the high pressure "fracking" - as the process is also known - may have caused the quakes. "The timing of the two events in conjunction with the fluid injection suggests that they may be related," it said.

In Arkansas, the state's oil and gas commission and the Arkansas Geological Survey said they have found no evidence that drilling or hydraulic fracturing caused a series of earthquakes there this spring. But they have not ruled out a link to the companies' practice of reinjecting wastewater into the geological structures.

"We see no correlation" between the drilling and fracking and the earthquake activity, AGS director Bekki White said in a telephone interview Wednesday. "As far as whether it is related to injection of fluids, we have not determined whether it is or whether it is naturally occurring."

She said the area is known as a highly active seismic zone. The state's oil and gas commission has imposed a moratorium on the drilling of new reinjection wells in Arkansas until the end of July. Companies such as BHP Billiton Ltd. and Clarita Operating LLC have said they will not inject wastewater into existing wells until the moratorium is lifted.

BHP acquired the property in Arkansas in March as part of a $4.75-billion (U.S.) acquisition of U.S. shale gas assets from Chesapeake Energy Corp.

Company spokesman Rubin Yogarajah said BHP is working with regulators to resolve concerns about water injection and seismic activity.

BHP and Clarita face class-action lawsuits from residents who claim the gas drilling triggered earthquakes, poisoned water sources, and caused other pollution. The industry says the area has naturally occurring seismic activity as well as methane in well water.

The shale gas boom has triggered battles between industry and the environmental community, and state and federal regulators over the potential threat to local water sources from not only drilling and fracturing, but the disposal of wastewater.

In Canada, Quebec imposed a partial moratorium on shale gas drilling pending further study, but the industry is booming in Western Canada, and small-scale exploration programs are planned in New Brunswick and Nova Scotia.

This week, New York Attorney-General Eric Schneiderman sued the U.S. federal government to force the Delaware River Basin Commission to undertake more extensive environmental reviews before allowing shale gas drilling in the basin, which provides drinking water to New York City, Trenton, N.J., and Philadelphia.

Texas has passed a law requiring companies to reveal some of the chemical ingredients of the fracturing fluid, and warned the Obama administration that it would oppose all efforts to impose federal regulations. Travis Windle, spokesman for industry group Marcellus Shale Coalition, condemned the "frivolous lawsuits and more unnecessary regulatory red tape." The association represents companies developing the prolific Marcellus deposit in Pennsylvania and West Virginia, including Calgary-based Talisman Energy Corp.

But environmentalists argue there are simply too many questions about the safety of hydraulic fracturing to allow drilling without environmental assessment of the site.

*****

SHALE GAS DREAMS SHATTERED
Recent earthquakes in the U.K. have raised questions about shale gas development
Strathrannoch, Highland
May 28, 2011
Magnitude: 1.5, 2.5
Isle of Mull, Argyll and Bute
May 7, 2011
Magnitude: 1.4
Blackpool, Lancashire
May 27, 2011
Magnitude: 1.5
THE GLOBE AND MAIL
SOURCE: DEPARTMENT OF ENERGY AND CLIMATE CHANGE
From: <frac-review@gov.ns.ca>
Date: 6/3/2011 9:41 PM
Subject: ban fracking in nova scotia

Dear Government Representatives

Thank you for allowing the people of this province to make comments on the issues regarding the ?Review of Hydraulic Fracturing in Shale Gas?.

I understand that this is a joint review by the departments of Energy and Environment.
I believe this 'Review' to be flawed from its outset. The review is not dealing with the question of whether or not fracking should be allowed in Nova Scotia. The 'Review' should also include all potential environmental and other, impacts. However, I do not believe this to be the case in this 'Review' process.

It has become every increasingly clear that fracking is not safe. It is a fact (Dr. Theo Colburn) that there are long term health effects, including hormone disruptors, as a result of fracking. As you will agree, our Health care system is already overtaxed. Greenhouse gases, the enormous use/waste of water, the amount of toxic waste water, the volatile organic compounds found in the air and increased pollutants from truck traffic, toxins of many forms on the soil of our many organic farms and the impact on our small landscape are only a few of our environmental concerns. The quality of life enjoyed in our rural communities, the tourism it affords, decreasing property values if fracking were to happen, and the stress put on our rural roads by heavy truck traffic day and night are only a few of the other negative impacts that fracking would bring to our province.

I am amongst the growing number of residents along the North Shore asking our provincial government for a ban on all fracking in this province. I moved here from the West Coast twenty-six years ago and have raised my family of four here - and now am a grandmother of four-three of whom live here. The health and welfare of these children and this land are of primary importance to me. My own children grew up with a love and respect for their natural environment and thrived physically, mentally and spiritually because of it.

Allowing fracking, or even test drilling, is not the way this province should be moving. We believe in, and are striving for, a sustainable community.

Please do what is right for your people, your province and this planet. Thank you.

Sincerely,

Lyn Sutherland
From: William Zimmerman
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 10:19 PM
Subject: Comments on Draft Scope

Dear Frac Review Panel:

In examining your Draft Scope I was disappointed to see that the scope neglected to address most of the components called for in the examination of development projects. We are normally asked to address social, cultural, economic and environmental issues related to projects in order to address the full range of development concerns.

While some economic issues are at least referenced in the governments discussion of the proposed hydraulic fracturing for shale gas production, the externalities, economic impacts not directly effecting the operators but more relevant to the larger community, are largely ignored.

I feel that any serious study examining the impacts of hydraulic fracturing for shale gas production must consider social, cultural and the full range of economic impacts to be of any value. Even if the process could be carried out in a way that didn’t adversely effect the water system (something which I seriously doubt) I would think that the other impacts would be, on balance, negative.

Sincerely yours,

William Zimmerman, P. Engr.
From: Johanna Padelt
To: <frac-review@gov.ns.ca>
Date: 6/3/2011 11:06 PM
Subject: Hydraulic fracturing

Dear Team of Senior Technical and Policy Staff,
I am writing to address the province's review of hydraulic fracturing. I would like to urge you to take this matter very seriously and to study the effects fracturing practices have had on people, animals and the environment in other places in North America. I saw the film, "Gaslands," and if you have not seen it, I urge you to watch it. I wept as I saw the beautiful places that I had traveled through long ago and that were now contaminated and poisoned by this process called fracturing. The land, the air, the water, the animals, the people--Poisoned.
And the companies convinced the people everything would be all right, as they are trying to convince us right now in Nova Scotia that everything will be all right. Don't believe their propaganda. Do your own research and count on the worst scenario................When have we ever gotten it right when the profit motive is the main consideration?

I have made Cape Breton Island my home for 40 years. I moved here because of the clean air and water and the scenic beauty of the land. I feel blessed to be able to live here. While I do not live directly in the area of the proposed test drilling at Lake Ainslie, I feel vehemently threatened by anything that threatens to destroy what I came here for and what thousands of tourists come here for. I don't want this kind of development on this island.

So, when you are doing your research and assessing all of the relevant factors in making your decision remember the Cree saying:
"Only when the last tree has died and the last river been poisoned and the last fish been caught will we realize that we cannot eat money."

Sincerely yours,
Johanna Padelt
May 30, 2011

Dear Committee,

I have previously written you a letter re: my opposition to "fracking" in Nova Scotia. Enclosed is an article from Discover Magazine (I believe it is May, 2011) reiterating many of my concerns.

Nova Scotia does not need this devastating pollution! To quote Joni Mitchell - "give paradise a put up a parking lot!" My this is much worse.

Sincerely,

[Signature]
Article on Fracking.
Tracy Bank was concerned. A geochemist, she makes her living studying how water interacts with rocks. And four years ago, when she arrived at the State University of New York at Buffalo, water was definitely interacting with rocks.

Buffalo is perched on the edge of the largest known reservoir of natural gas in America, a geologic formation known as the Marcellus Shale. The 95,000-square-mile slab, which lies under sizable portions of West Virginia, New York, Ohio, and Pennsylvania, could contain up to 500 trillion cubic feet of natural gas—enough to meet the nation's natural gas needs for at least two years. Owing to this bounty, the areas above the shale are now in the grip of an unprecedented gas-drilling boom. The gas is extracted using a method called hydraulic fracturing, or fracking, a technique that involves pumping millions of gallons of water laced with chemicals deep underground to blast open the shale and release the gas trapped inside. The blasting is what got Bank worried.

Fracking has already drawn considerable scrutiny from environmental groups, unhappy homeowners, and teams of lawyers who blame the drilling method for polluting pristine rivers, turning bucolic farmlands into noisy industrial zones, and leaking enough methane to make ordinary tap water as flammable as lighter fluid. Bank is now bringing attention to yet another problem: radiation. Her research shows that high-pressure fluids striking the shale could dislodge naturally occurring radioactive compounds such as uranium and strontium, putting groundwater at risk of contamination.

"Shale is a garbage-bucket rock," she says. "The more organically rich the shale is, the more natural gas is present, but the more other stuff is in there too."

To determine how fracking fluids mobilize metals in the shale, Bank and her team solicited rock samples from drill sites in western New York and Pennsylvania. When the researchers subjected their samples to leaching ions—a high-precision way to dislodge surface chemicals—they confirmed that shale rocks contain a suite of toxic metals, including uranium, barium, chromium, zinc, and arsenic. Bank also discovered something new and disturbing: The metals were chemically bound to hydrocarbons, the organic compounds that make up natural gas. Separated from the rock, uranium or any other toxic metal could easily hitch a ride when the drilling wastewater is siphoned back to the surface, Bank found.

"If the goal of fracking is to extract that organic matter—the natural gas—then you're mobilizing the uranium as well," she says. As a result, she believes, the current methods for cleaning wastewater generated by fracking are woefully inadequate. Right now, water is injected into disposal wells, dumped into evaporation pits, or run through drinking-water treatment facilities. "This water needs to be treated like industrial waste," Bank says. Otherwise, radioactive material and a slew of other toxic compounds could leach into the groundwater, potentially tainting it for generations.
Bank's discovery is just the latest twist in the convoluted tale of fracking, which neatly pits two environmental agendas against each other. Investigations by The New York Times last winter revealed that sewage-treatment plants processing fracking wastewater are discharging radioactive fluid into public waterways, in some cases upstream of intake sites for drinking water. "It's long been known that the Marcellus Shale is a radioactive formation," says Kate Sinding, a senior attorney with the Natural Resources Defense Council. "But these concerns have never been dealt with."

On the other hand, the arguments for drilling into the Marcellus Shale are hard to ignore. Natural gas is by far the cleanest-burning fossil fuel, producing about half as much carbon dioxide as the energy-equivalent amount of coal. It also contains almost none of the heavy metals that frequently accompany coal. Moreover, our domestic reserves of natural gas are plentiful: The newly tapped deposits in the Marcellus Shale have helped to more than double the nation's estimated shale gas reserves, from 23 trillion cubic feet in 2007 to some 60 trillion cubic feet in 2009. The Department of Energy estimates that natural gas produces slightly more than one-fifth of all the electricity used in the United States, and that number is steadily rising. If production continues as planned, over the next couple of decades natural gas could supplant coal as the leading domestic fossil fuel, serving as a cleaner way to heat our homes and fire our electric plants. "We've got terrific natural gas resources," says David Burnett, director of technology at the Global Petroleum Research Institute at Texas A&M University. "Our country is going broke, but the public refuses to realize how much money they're spending on imported energy."

Ernest Moniz, director of the MIT Energy Initiative and a former undersecretary of energy, sees natural gas as the energy source of choice until renewable sources like wind, solar, and geothermal become more commercially viable. "Natural gas truly is a bridge to a low-carbon future and could enable very substantial reductions in carbon emissions—as much as 50 percent by 2050," he says. Assuming we can tolerate the collateral damage.

The Marcellus Shale formed as tectonic plates pushed up the landmasses that created the Appalachian and Catskill mountain ranges and buried the ancient sea under a layer of rock almost two miles thick. This compression process produced gaseous hydrocarbons that expanded and formed pockets and fissures in the rock formations that now hold natural gas. For six decades gas outfitters...
a baseball hitting a windowpane, pushing natural gas and oil out of the rock and into the pipe when the water was pumped back out.

However, the technique proved difficult to use in shale deposits, which form in layers that are wide but shallow. Vertical drilling in shale hit too little surface area to suck up enough gas to make the effort worthwhile. "If you can't turn the well so it goes along the shale formation and a lot of the well is exposed to the gas, you can't get the gas out economically," says Anthony Ingraffea, a hydraulic fracturing expert and professor of civil and environmental engineering at Cornell University.

In the 1990s, new drilling technology developed in Texas made recovering gas from shale far more efficient. The big innovation was a motor attached to the drill bit that allowed it to turn 90 degrees and bore horizontally for up to two miles. Boring parallel to the horizontal shale layers exposes much more of the gas deposits. Companies can also drill multiple wells in any direction from just one drilling pad, creating a honeycomb of tunnels miles beneath the surface that can siphon gas from hundreds of acres.

Next comes the even more difficult part. Typically, each well requires 2 million to 10 million gallons of water to extract the gas. As with conventional drilling, the water is mixed with sand to keep the fissures propped open, and with a cocktail of friction-reducing lubricants to make the water slick enough to slide through the pipes swiftly. Machinery has to pump the water at pressures high enough to send it anywhere from 1,000 feet to a mile down. It is not uncommon during drilling for a site to have at least 10 trucks with 1,000-horsepower pumps and for dozens of tanker trucks to make 500 to 1,200 trips transporting water if there is no on-site source.

Despite concerns that fracking could seriously deplete or contaminate local water supplies, in 2010 Pennsylvania issued more than 3,300 natural gas permits in the Marcellus Shale. Almost 1,500 wells were drilled, and thousands more are on the way. Other parts of the country with shale beds ("plays" in industry parlance), such as Wyoming, Colorado, Arkansas, and Louisiana, have experienced similar gas drilling booms.

To comprehend the long-term implications of hydraulic fracturing, you need to visit the region where gas drilling first boomed. It sits above the Barnett Shale a formation that underlies 5,000 square miles surrounding Fort Worth, Texas. Large-scale fracking began here in 2002. There are now about 14,000 gas wells in the area, and it is there that the environmental fallout of fracking has been most pronounced. Residents have complained for years of contaminated water, poor air quality, and unexplained health problems such as headaches, dizziness, blackouts, and muscle contractions.

Drilling operations have turned
some of Texas’s most affluent communities into industrial wastelands. In towns like Argyle and Bartonville, where drill rigs have been erected within a mile of schools, children complain of nosebleeds, dizziness, and nausea. Parents worry about the release of the cancer-causing chemical benzene in the air above gas fields from processing plants and equipment.

**FRACTURING IN THE** Marcellus Shale has not been going on as long as it has in Texas, but residents have already begun to experience its dark side. Just ask Craig and Julie Sautner. When the cable technician and his wife moved to Dimock, an agricultural community of about 1,500 nestled in the rolling hills of northeastern Pennsylvania, they had no inkling they were sitting on top of a mother lode of natural gas—that is, not until an agent from Cabot Oil & Gas, a Houston-based natural gas producer, knocked on their door in May 2008. He offered them $10,000 to lease the mineral rights on their four acres, with the promise of even more in royalties if Cabot struck “pay dirt.” You might as well sign it because all your neighbors are,” the man said, according to Craig. “If you don’t, you’ll miss out.”

In August 2008, the company started drilling less than 1,000 feet from the Sautner’s’ water well. By mid-September the family’s tap water was undrinkable. “I noticed the toilet water was murky, and when I used the water in the sink in the kitchen, it was brown,” Craig recalls. He called Cabot Oil & Gas to complain, but representatives insisted there was no way that Cabot’s drilling process could have contaminated the Sautner’s well water. The gas deposits sit thousands of feet below water wells, the company told him. What’s more, the boreholes that channel the natural gas up to the surface are encased in steel and cement. But without admitting fault, Cabot installed a water filtration system in the Sautners’ basement, which now looks like a “science lab,” Craig says.

Tests conducted soon after by the Pennsylvania Department of Environmental Protection revealed that the Sautners’ water contained high levels of methane, the main component of natural gas. Although methane is not normally harmful to drink in concentrations below 10 milligrams per liter, it can evaporate from the water. If it collects in enclosed spaces like basements, it can become flammable and explode or suffocate those who inhale it. The Sautners, who have joined with a group of neighbors and filed a lawsuit against Cabot, worry that the methane could explode at any time. “My son asks every night,” Craig says, with no small measure of gallows humor. “Do you think we’ll wake up in the morning?”

Industry experts respond that it is impossible for their wells to be creating all the environmental havoc their critics charge. “If you calculate the environmental footprint of one drilling operation, it’s smaller than a big-box store,” Texas A&M’s Burnett says. “Most companies employ the same safety practices they use with industrial petrochemical facilities.”

But the US Environmental Protection Agency, which declared in a 2004 study that fracking posed “little or no threat to underground sources of drinking water,” is now reconsidering its conclusion. The state of New York has stopped issuing horizontal drilling...
permits for the Marcellus Shale while it completes an environmental review. The Marcellus sits atop the Delaware River watershed, which supplies drinking water to 17 million people, including residents of Philadelphia and New York City. A bill now under consideration on Capitol Hill would grant the EPA oversight of fracking and force drilling companies, which are currently exempt from portions of the Clean Water Act, to disclose the chemicals they use in fracturing fluids.

At every checkpoint in the development pipeline, Ingraffia says, there is potential for trouble. "It's disturbing how densely they're trying to pack these wells. The record I know of is 16 wells on one pad. The enormous amount of water injected into such a small volume of rock is creating much more pressure than there has ever been there."

There have been reports of small earthquakes near some injection sites for fracturing waste in Texas, a state not known for seismic activity. Last fall a swarm of about 500 mini-quakes rocked central Arkansas near the Fayetteville Shale, and a 4.7-magnitude earthquake in February prompted the Arkansas Oil and Gas Commission to order two drilling companies to temporarily suspend operations.

Add a host of unknowns—like possible faulty cement jobs in the pipes, which was the cause of the Deepwater Horizon blowout in the Gulf of Mexico, or hitting an abandoned gas and oil well—and the potential for danger expands exponentially.

But it is the threat to the water supply that prompts the loudest warnings. A team of environmental scientists hired by New York City in 2009 to evaluate fracking's environmental impact concluded that the process could be "catastrophic" to the city's water supply because it degraded water quality and exposed residents to potentially "chronic low levels of toxic chemicals."

Health risks aside, natural gas may ultimately prove no cleaner than America's other abundant domestic fossil fuel, coal. Cornell University researchers factored in the carbon emissions over the course of natural gas's life cycle when it is extracted using hydraulic fracturing—which includes drilling the wells, erecting the construction sites, building pipelines to transport the gas, fueling the pumps that force the water underground, and transporting the wastewater—and concluded that natural gas is dirtier than coal. Another wild card is methane, which inevitably seeps out during the extraction process, escaping from imperfect joints on thousands of pipes, valves, compressors, and holding tanks, or simply migrating through hairline cracks in the rock. Methane is 20 times as damaging as a greenhouse gas as carbon dioxide.

The solution to all of these concerns may be to make fracking more efficient and less toxic. One promising way to do that was recently tested on a string of more than a dozen natural gas wells in the heart of the Texas oil fields. Instead of pumping millions of gallons of water and fracturing fluid into the earth, the company GasFrac used a liquefied petroleum gas gel—propane gas compressed into a thick fluid—to break up the rock. This simple switch could pave the way toward a more environmentally friendly method of extracting natural gas that would do less collateral damage to the land and water while dramatically reducing frackings carbon footprint at the same time.

Liquefied petroleum gas (LPG) has a number of advantages over the chemical-laced water typically used as a fracturing fluid. Although it is pumped into the well as a gelled liquid, it converts back into gas while underground. It can then be sucked back out as the natural gas is extracted from the reservoir, meaning that there is a virtually complete recovery of the fracturing fluid; water-based methods have roughly a 50 percent recovery rate. Since the LPG is almost 100 percent retrievable, the time and effort of recovering, filtering, and reuseing the fluid are dramatically reduced. Propane is less dense than water; so LPG-based fracking projects should require less truck traffic and smaller staging areas, which cuts carbon emissions. This approach also eliminates the need for freshwater tanks or pits for waste and bypasses many of the concerns about tainting groundwater.

Without switching to LPG fracking, some companies are already attempting to clean up natural gas drilling to address the concerns of local communities. In western Colorado, for example, Antero Resources Corp. negotiated an agreement with civic leaders to use nontoxic hydraulic fracturing fluids, monitor water supplies, and avoid the use of wastewater disposal pits. To encourage better drilling practices, the Houston Advanced Research Center—a consortium supported by government, foundations, and private industry—launched the Environmentally Friendly Drilling Scorecard at the end of last year. The scorecard awards companies up to five stars based on their use of cleaner oil and gas drilling techniques, including smaller and more lightweight rigs, well site and road construction that employs low-impact technologies, lower-emission power packages, or advanced water-management systems.

The scorecard is still in the test phase, so no companies drilling in the Marcellus Shale have yet publicly adopted it, though Halliburton has agreed to disclose the chemicals it is using in its fracturing fluids. Ratcheting up the pressure, the EPA and the Pennsylvania Department of Environmental Protection are both taking a closer look at the environmental costs of fracking and are investigating the uranium findings made by Tracy Bank, who continues to research how fracking impacts toxic metals. The EPA is also aggressively prodding state regulators and others involved in natural gas extraction in the Marcellus Shale to release what they know about radioactivity in the wastewater.

Even skeptics like the NRDC's Kate Sinding recognize that fracking is not going away. The economic and environmental factors in favor of natural gas are simply too powerful. "Nothing is ever going to be completely safe or perfect," Sinding says. "The key is to get an inventory of best practices and then make sure you have the resources to implement and enforce them."

As the Deepwater Horizon oil spill proved, allowing drilling technology to outpace the development of sound safeguards is courting disaster. Especially when that drilling is going on in someone's backyard.
From: René Halden
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 5:43 AM
Subject: Hydraulic Fracturing

Dear Team of Senior Technical and Policy Staff,

My name is Rene Halden
N.S. I am one of the many Nova Scotians that obtains drinking and domestic water from a well on my property. I am also a user of Cape Breton Regional Municipal water supply. I am also an avid salmon angler and own property in Inverness county. also using well water, that permits me to enjoy this recreation.

Extensive reading about the experiences of Albertans makes it obvious that the chemicals used in hydraulic fracturing procedures to extract gas have contaminated major water tables and the data from the United States reveals the same. The proponents of fracturing have denied the use of harmful additives to the vast amounts of water used in the process citing proprietary rights but the chemicals have been identified by the United States House of Representatives Committee of Energy and Commerce Minority Staff, April 2011 report titled “Chemicals Used in Hydraulic Fracturing” which I attach to this message. I believe that hydraulic fracturing in Inverness County will contaminate the local water table and in particular impact the valuable local angling industry upon which so many residents depend for a livelihood.

All governments are permanently short of funds and there is a lack of funding to enforce environmental protection in general except where it impacts profit taking, and governments succumb to the short term economic benefits that provide tax revenue disregarding the long term destruction of water supplies and needs of citizens.

I therefore strongly object to the use of hydraulic fracturing technology in Nova Scotia and urge a ban on any projects especially since the admission of one opens the door to many more and once initiated, the North American Free Trade Agreement makes it impossible for governments to regulate or ban.

Rene Halden,
UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE
MINORITY STAFF
APRIL 2011

CHEMICALS USED IN HYDRAULIC FRACTURING

PREPARED BY COMMITTEE STAFF FOR:

Henry A. Waxman  Edward J. Markey  Diana DeGette
Ranking Member  Ranking Member  Ranking Member
Committee on Energy  Committee on Natural  Subcommittee on Oversight
    and Commerce  Resources  and Investigations
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I. EXECUTIVE SUMMARY

Hydraulic fracturing has helped to expand natural gas production in the United States, unlocking large natural gas supplies in shale and other unconventional formations across the country. As a result of hydraulic fracturing and advances in horizontal drilling technology, natural gas production in 2010 reached the highest level in decades. According to new estimates by the Energy Information Administration (EIA), the United States possesses natural gas resources sufficient to supply the United States for approximately 110 years.

As the use of hydraulic fracturing has grown, so have concerns about its environmental and public health impacts. One concern is that hydraulic fracturing fluids used to fracture rock formations contain numerous chemicals that could harm human health and the environment, especially if they enter drinking water supplies. The opposition of many oil and gas companies to public disclosure of the chemicals they use has compounded this concern.

Last Congress, the Committee on Energy and Commerce launched an investigation to examine the practice of hydraulic fracturing in the United States. As part of that inquiry, the Committee asked the 14 leading oil and gas service companies to disclose the types and volumes of the hydraulic fracturing products they used in their fluids between 2005 and 2009 and the chemical contents of those products. This report summarizes the information provided to the Committee.

Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 730 million gallons of hydraulic fracturing products—not including water added at the well site—between 2005 and 2009.

Some of the components used in the hydraulic fracturing products were common and generally harmless, such as salt and citric acid. Some were unexpected, such as instant coffee and walnut hulls. And some were extremely toxic, such as benzene and lead. Appendix A lists each of the 750 chemicals and other components used in hydraulic fracturing products between 2005 and 2009.

The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of compounds containing the chemical, was methanol. Methanol, which was used in 342 hydraulic fracturing products, is a hazardous air pollutant and is on the candidate list for potential regulation under the Safe Drinking Water Act. Some of the other most widely used chemicals were isopropyl alcohol (used in 274 products), 2-butoxyethanol (used in 126 products), and ethylene glycol (used in 119 products).

Between 2005 and 2009, the oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals were components of more than 650 different products used in hydraulic fracturing.
The BTEX compounds – benzene, toluene, xylene, and ethylbenzene – appeared in 60 of the hydraulic fracturing products used between 2005 and 2009. Each BTEX compound is a regulated contaminant under the Safe Drinking Water Act and a hazardous air pollutant under the Clean Air Act. Benzene also is a known human carcinogen. The hydraulic fracturing companies injected 11.4 million gallons of products containing at least one BTEX chemical over the five-year period.

In many instances, the oil and gas service companies were unable to provide the Committee with a complete chemical makeup of the hydraulic fracturing fluids they used. Between 2005 and 2009, the companies used 94 million gallons of 279 products that contained at least one chemical or component that the manufacturers deemed proprietary or a trade secret. Committee staff requested that these companies disclose this proprietary information. Although some companies did provide information about these proprietary fluids, in most cases the companies stated that they did not have access to proprietary information about products they purchased “off the shelf” from chemical suppliers. In these cases, the companies are injecting fluids containing chemicals that they themselves cannot identify.

II. BACKGROUND

Hydraulic fracturing – a method by which oil and gas service companies provide access to domestic energy trapped in hard-to-reach geologic formations — has been the subject of both enthusiasm and increasing environmental and health concerns in recent years. Hydraulic fracturing, used in combination with horizontal drilling, has allowed industry to access natural gas reserves previously considered uneconomical, particularly in shale formations. As a result of the growing use of hydraulic fracturing, natural gas production in the United States reached 21.577 billion cubic feet in 2010, a level not achieved since a period of high natural gas production between 1970 and 1974.1 Overall, the Energy Information Administration now projects that the United States possesses 2,552 trillion cubic feet of potential natural gas resources, enough to supply the United States for approximately 110 years. Natural gas from shale resources accounts for 827 trillion cubic feet of this total, which is more than double what the EIA estimated just a year ago.2

Hydraulic fracturing creates access to more natural gas supplies, but the process requires the use of large quantities of water and fracturing fluids, which are injected underground at high volumes and pressure. Oil and gas service companies design fracturing fluids to create fractures and transport sand or other granular substances to prop open the fractures. The composition of these fluids varies by formation, ranging from a simple mixture of water and sand to more complex mixtures with a multitude of chemical additives. The companies may use these

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chemical additives to thicken or thin the fluids, improve the flow of the fluid, or kill bacteria that can reduce fracturing performance.³

Some of these chemicals, if not disposed of safely or allowed to leach into the drinking water supply, could damage the environment or pose a risk to human health. During hydraulic fracturing, fluids containing chemicals are injected deep underground, where their migration is not entirely predictable. Well failures, such as the use of insufficient well casing, could lead to their release at shallower depths, closer to drinking water supplies.⁴ Although some fracturing fluids are removed from the well at the end of the fracturing process, a substantial amount remains underground.⁵

While most underground injections of chemicals are subject to the protections of the Safe Drinking Water Act (SDWA), Congress in 2005 modified the law to exclude "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities" from the Act's protections.⁶ Unless oil and gas service companies use diesel in the hydraulic fracturing process, the permanent underground injection of chemicals used for hydraulic fracturing is not regulated by the Environmental Protection Agency (EPA).

Concerns also have been raised about the ultimate outcome of chemicals that are recovered and disposed of as wastewater. This wastewater is stored in tanks or pits at the well site, where spills are possible.¹ For final disposal, well operators must either recycle the fluids for use in future fracturing jobs, inject it into underground storage wells (which, unlike the fracturing process itself, are subject to the Safe Drinking Water Act), discharge it to nearby surface water, or transport it to wastewater treatment facilities.¹ A recent report in the New York

³U.S. Environmental Protection Agency, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004) (EPA 816-R-04-003) at 4-1 and 4-2.


⁵John A. Veil, Argonne National Laboratory, Water Management Technologies Used by Marcellus Shale Gas Producers, prepared for the Department of Energy (July 2010), at 13 (hereinafter "Water Management Technologies").

⁶42 U.S.C. § 300h(d). Many dubbed this provision the "Halliburton loophole" because of Halliburton's ties to then-Vice President Cheney and its role as one of the largest providers of hydraulic fracturing services. See The Halliburton Loophole, New York Times (Nov. 9, 2009).


Times raised questions about the safety of surface water discharge and the ability of water treatment facilities to process wastewater from natural gas drilling operations. 9

Any risk to the environment and human health posed by fracturing fluids depends in large part on their contents. Federal law, however, contains no public disclosure requirements for oil and gas producers or service companies involved in hydraulic fracturing, and state disclosure requirements vary greatly. 10 While the industry has recently announced that it soon will create a public database of fluid components, reporting to this database is strictly voluntary, disclosure will not include the chemical identity of products labeled as proprietary, and there is no way to determine if companies are accurately reporting information for all wells. 11

The absence of a minimum national baseline for disclosure of fluids injected during the hydraulic fracturing process and the exemption of most hydraulic fracturing injections from regulation under the Safe Drinking Water Act has left an informational void concerning the contents, chemical concentrations, and volumes of fluids that go into the ground during fracturing operations and return to the surface in the form of wastewater. As a result, regulators and the public are unable effectively to assess any impact the use of these fluids may have on the environment or public health.

III. METHODOLOGY

On February 18, 2010, the Committee commenced an investigation into the practice of hydraulic fracturing and its potential impact on water quality across the United States. This investigation built on work begun by Ranking Member Henry A. Waxman in 2007 as Chairman of the Committee on Oversight and Government Reform. The Committee initially sent letters to eight oil and gas service companies engaged in hydraulic fracturing in the United States. In May 2010, the Committee sent letters to six additional oil and gas service companies to assess a

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10 Wyoming, for example, recently enacted relatively strong disclosure regulations, requiring disclosure on a well-by-well basis and “for each stage of the well stimulation program,” “the chemical additives, compounds and concentrations or rates proposed to be mixed and injected.” See WY WR 055-000-003 Sec. 45. Similar regulations became effective in Arkansas this year. See Arkansas Oil and Gas Commission Rule B-19. In Wyoming, much of this information is, after an initial period of review, available to the public. See WY WR 055-000-003 Sec. 21. Other states, however, do not insist on such robust disclosure. For instance, West Virginia has no disclosure requirements for hydraulic fracturing and expressly exempts fluids used during hydraulic fracturing from the disclosure requirements applicable to underground injection of fluids for purposes of waste storage. See W. Va. Code St. R. § 34-5-7.

broader range of industry practices. The February and May letters requested information on the type and volume of chemicals present in the hydraulic fracturing products that each company used in their fluids between 2005 and 2009.

The 14 oil and gas service companies that received the letter voluntarily provided substantial information to the Committee. As requested, the companies reported the names and volumes of the products they used during the five-year period. For each hydraulic fracturing product reported, the companies also provided a Material Safety Data Sheet (MSDS) detailing the product's chemical components. The Occupational Safety and Health Administration (OSHA) requires chemical manufacturers to create a MSDS for every product they sell as a means to communicate potential health and safety hazards to employees and employers. The MSDS must list all hazardous ingredients if they comprise at least 1% of the product; for carcinogens, the reporting threshold is 0.1%.

Under OSHA regulations, manufacturers may withhold the identity of chemical components that constitute "trade secrets." If the MSDS for a particular product used by a company subject to the Committee's investigation reported that the identity of any chemical component was a trade secret, the Committee asked the company that used that product to provide the proprietary information, if available.

IV. HYDRAULIC FRACTURING FLUIDS AND THEIR CONTENTS

Between 2005 and 2009, the 14 oil and gas service companies used more than 2,500 hydraulic fracturing products containing 750 chemicals and other components. Overall, these companies used 780 million gallons of hydraulic fracturing products in their fluids between 2005 and 2009. This volume does not include water that the companies added to the fluids at the well site before injection. The products are comprised of a wide range of chemicals. Some are seemingly harmless like sodium chloride (salt), gelatin, and citric acid. Others could pose a severe risk to human health or the environment.

The Committee sent letters to Basic Energy Services, BJ Services, Calfrac Well Services, Complete Production Services, Frac Tech Services, Halliburton, Key Energy Services, RPC, Sancell Corporation, Schlumberger, Superior Well Services, Trican Well Service, Universal Well Services, and Weatherford.

BJ Services, Halliburton, and Schlumberger already had provided the Oversight Committee with data for 2005 through 2007. For BJ Services, the 2005-2007 data is limited to natural gas wells. For Schlumberger, the 2005-2007 data is limited to coalbed methane wells.

Each hydraulic fracturing "product" is a mixture of chemicals or other components designed to achieve a certain performance goal, such as increasing the viscosity of water. Some oil and gas service companies create their own products; most purchase these products from chemical vendors. The service companies then mix these products together at the well site to formulate the hydraulic fracturing fluids that they pump underground.
Some of the components were surprising. One company told the Committee that it used instant coffee as one of the components in a fluid designed to inhibit acid corrosion. Two companies reported using walnut hulls as part of a breaker—a product used to degrade the fracturing fluid viscosity, which helps to enhance post-fracturing fluid recovery. Another company reported using carbohydrates as a breaker. One company used tallow soap—soap made from beef, sheep, or other animals—to reduce loss of fracturing fluid into the exposed rock.

Appendix A lists each of the 750 chemicals and other components used in the hydraulic fracturing products injected underground between 2005 and 2009.

A. Commonly Used Chemical Components

The most widely used chemical in hydraulic fracturing during this time period, as measured by the number of products containing the chemical, was methanol. Methanol is a hazardous air pollutant and a candidate for regulation under the Safe Drinking Water Act. It was a component in 342 hydraulic fracturing products. Some of the other most widely used chemicals include isopropyl alcohol, which was used in 274 products, and ethylene glycol, which was used in 119 products. Crystalline silica (silicon dioxide) appeared in 207 products, generally proppants used to hold open fractures. Table 1 has a list of the most commonly used compounds in hydraulic fracturing fluids.

<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methanol (Methyl alcohol)</td>
<td>342</td>
</tr>
<tr>
<td>Isopropanol (Isopropyl alcohol, Propan-2-ol)</td>
<td>274</td>
</tr>
<tr>
<td>Crystalline silica-quartz (SiO2)</td>
<td>207</td>
</tr>
<tr>
<td>Ethylene glycol monobutyl ether (2-butoxyethanol)</td>
<td>126</td>
</tr>
<tr>
<td>Ethylene glycol (1,2-ethanediol)</td>
<td>119</td>
</tr>
<tr>
<td>Hydro treated light petroleum distillate</td>
<td>89</td>
</tr>
<tr>
<td>Sodium hydroxide (Caustic soda)</td>
<td>80</td>
</tr>
</tbody>
</table>
Hydraulic fracturing companies used 2-butoxyethanol (2-BE) as a foaming agent or surfactant in 128 products. According to EPA scientists, 2-BE is easily absorbed and rapidly distributed in humans following inhalation, ingestion, or dermal exposure. Studies have shown that exposure to 2-BE can cause hemolysis (destruction of red blood cells) and damage to the spleen, liver, and bone marrow.\textsuperscript{17} The hydraulic fracturing companies injected 21.9 million gallons of products containing 2-BE between 2005 and 2009. They used the highest volume of products containing 2-BE in Texas, which accounted for more than half of the volume used. EPA recently found this chemical in drinking water wells tested in Pavillion, Wyoming.\textsuperscript{18} Table 2 shows the use of 2-BE by state.

<table>
<thead>
<tr>
<th>State</th>
<th>Fluid Volume (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>12,031,734</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>2,106,613</td>
</tr>
<tr>
<td>New Mexico</td>
<td>1,561,341</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,147,614</td>
</tr>
<tr>
<td>Louisiana</td>
<td>890,068</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>747,416</td>
</tr>
<tr>
<td>West Virginia</td>
<td>464,231</td>
</tr>
<tr>
<td>Utah</td>
<td>382,874</td>
</tr>
<tr>
<td>Montana</td>
<td>362,497</td>
</tr>
<tr>
<td>Arkansas</td>
<td>348,959</td>
</tr>
</tbody>
</table>

\textsuperscript{17} EPA, Toxicological Review of Ethylene Glycol Monobutyl Ether (Mar. 2010) at 4.

B. Toxic Chemicals

The oil and gas service companies used hydraulic fracturing products containing 29 chemicals that are (1) known or possible human carcinogens, (2) regulated under the Safe Drinking Water Act for their risks to human health, or (3) listed as hazardous air pollutants under the Clean Air Act. These 29 chemicals were components of 852 different products used in hydraulic fracturing. Table 3 lists these toxic chemicals and their frequency of use.

<table>
<thead>
<tr>
<th>Table 3: Chemicals Components of Concern: Carcinogens, SDWA-Regulated Chemicals, and Hazardous Air Pollutants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Component</td>
</tr>
<tr>
<td>Methanol (Methyl alcohol)</td>
</tr>
<tr>
<td>Ethylene glycol (1,2-ethanediol)</td>
</tr>
<tr>
<td>Diesel †</td>
</tr>
<tr>
<td>Naphthalene</td>
</tr>
<tr>
<td>Xylene</td>
</tr>
<tr>
<td>Hydrogen chloride (Hydrochloric acid)</td>
</tr>
<tr>
<td>Toluene</td>
</tr>
<tr>
<td>Ethylbenzene</td>
</tr>
<tr>
<td>Diethanolamine (2,2-dimethanol)</td>
</tr>
<tr>
<td>Formaldehyde</td>
</tr>
<tr>
<td>Sulfuric acid</td>
</tr>
<tr>
<td>Thiourea</td>
</tr>
<tr>
<td>Benzyl chloride</td>
</tr>
<tr>
<td>Quinone</td>
</tr>
<tr>
<td>Nitric acid</td>
</tr>
<tr>
<td>Dimethyl formamide</td>
</tr>
<tr>
<td>Phenol</td>
</tr>
<tr>
<td>Benzene</td>
</tr>
<tr>
<td>Di(2-ethylhexyl) phthalate</td>
</tr>
<tr>
<td>Acrylamide</td>
</tr>
<tr>
<td>Hydrogen fluoride (Hydrofluoric acid)</td>
</tr>
<tr>
<td>Phthalic anhydride</td>
</tr>
<tr>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Acetophenone</td>
</tr>
<tr>
<td>Copper</td>
</tr>
<tr>
<td>Ethylene oxide</td>
</tr>
<tr>
<td>Lead</td>
</tr>
<tr>
<td>Propylene oxide</td>
</tr>
<tr>
<td>p-Xylene</td>
</tr>
<tr>
<td>Number of Products Containing a Component of Concern</td>
</tr>
</tbody>
</table>

† According to EPA, diesel contains benzene, toluene, ethylbenzene, and xylenes. See EPA, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004) (EPA 816-R-04-003) at 4-11.
1. Carcinogens

Between 2005 and 2009, the hydraulic fracturing companies used 95 products containing 13 different carcinogens. These included naphthalene (a possible human carcinogen), benzene (a known human carcinogen), and acrylamide (a probable human carcinogen). Overall, these companies injected 10.2 million gallons of fracturing products containing at least one carcinogen. The companies used the highest volume of fluids containing one or more carcinogens in Texas, Colorado, and Oklahoma. Table 4 shows the use of these chemicals by state.

<table>
<thead>
<tr>
<th>State</th>
<th>Fluid Volume (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Texas</td>
<td>3,877,273</td>
</tr>
<tr>
<td>Colorado</td>
<td>1,544,368</td>
</tr>
<tr>
<td>Oklahoma</td>
<td>1,098,746</td>
</tr>
<tr>
<td>Louisiana</td>
<td>777,945</td>
</tr>
<tr>
<td>Wyoming</td>
<td>759,998</td>
</tr>
<tr>
<td>North Dakota</td>
<td>567,519</td>
</tr>
<tr>
<td>New Mexico</td>
<td>511,196</td>
</tr>
<tr>
<td>Montana</td>
<td>394,873</td>
</tr>
<tr>
<td>Utah</td>
<td>382,338</td>
</tr>
</tbody>
</table>

2. Safe Drinking Water Act Chemicals

Under the Safe Drinking Water Act, EPA regulates 53 chemicals that may have an adverse effect on human health and are known to or likely to occur in public drinking water systems at levels of public health concern. Between 2005 and 2009, the hydraulic fracturing companies used 67 products containing at least one of eight SDWA-regulated chemicals. Overall, they injected 11.7 million gallons of fracturing products containing at least one chemical regulated under SDWA. Most of these chemicals were injected in Texas. Table 5 shows the use of these chemicals by state.

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For purposes of this report, a chemical is considered a "carcinogen" if it is on one of two lists: (1) substances identified by the National Toxicology Program as "known to be human carcinogens" or as "reasonably anticipated to be human carcinogens"; and (2) substances identified by the International Agency for Research on Cancer, part of the World Health Organization, as "carcinogenic" or "probably carcinogenic" to humans. See U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, Report on Carcinogens, Eleventh Edition (Jan. 31, 2005) and World Health Organization, International Agency for Research on Cancer, Agents Classified by the IARC Monographs (online at http://monographs.iarc.fr/ENG/Classification/index.php) (accessed Feb. 28, 2011).
The vast majority of these SDWA-regulated chemicals were the BTEX compounds—benzene, toluene, xylene, and ethylbenzene. The BTEX compounds appeared in 60 hydraulic fracturing products used between 2005 and 2009 and were used in 11.4 million gallons of hydraulic fracturing fluids. The Department of Health and Human Services, the International Agency for Research on Cancer, and EPA have determined that benzene is a human carcinogen. Chronic exposure to toluene, ethylbenzene, or xylenes also can damage the central nervous system, liver, and kidneys.

<table>
<thead>
<tr>
<th>Table 5. States with at Least 100,000 Gallons of Hydraulic Fracturing Fluids Containing a SDWA-Regulated Chemical (2005-2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
</tr>
<tr>
<td>Texas</td>
</tr>
<tr>
<td>New Mexico</td>
</tr>
<tr>
<td>Colorado</td>
</tr>
<tr>
<td>Oklahoma</td>
</tr>
<tr>
<td>Mississippi</td>
</tr>
<tr>
<td>North Dakota</td>
</tr>
</tbody>
</table>

In addition, the hydraulic fracturing companies injected more than 30 million gallons of diesel fuel or hydraulic fracturing fluids containing diesel fuel in wells in 19 states. In a 2004 report, EPA stated that the "use of diesel fuel in fracturing fluids poses the greatest threat" to underground sources of drinking water. Diesel fuel contains toxic constituents, including BTEX compounds.

EPA also has created a Candidate Contaminant List (CCL), which is a list of contaminants that are currently not subject to national primary drinking water regulations but are known or anticipated to occur in public water systems and may require regulation under the Safe Drinking Water Act in the future. Nine chemicals on that list—1-butanol, acetaldehyde, benzyl

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22 EPA, Basic Information about Toluene in Drinking Water, Basic Information about Ethylbenzene in Drinking Water, and Basic Information about Xylenes in Drinking Water (online at http://water.epa.gov/drink/contaminants/basicinformation/index.cfm) (accessed Oct. 14, 2010).


24 EPA, Evaluation of Impacts to Underground Sources of Drinking Water by Hydraulic Fracturing of Coalbed Methane Reservoirs (June 2004) (EPA 816-R-04-003) at 4-11.

25 Id.

chloride, ethylene glycol, ethylene oxide, formaldehyde, methanol, n-methyl-2-pyrrolidone, and propylene oxide—were used in hydraulic fracturing products between 2005 and 2009.

3. Hazardous Air Pollutants

The Clean Air Act requires EPA to control the emission of 187 hazardous air pollutants, which are pollutants that cause or may cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental and ecological effects. Between 2005 and 2009, the hydraulic fracturing companies used 595 products containing 24 different hazardous air pollutants.

Hydrogen fluoride is a hazardous air pollutant that is a highly corrosive and systemic poison that causes severe and sometimes delayed health effects due to deep tissue penetration. Absorption of substantial amounts of hydrogen fluoride by any route may be fatal. One of the hydraulic fracturing companies used 67,222 gallons of two products containing hydrogen fluoride in 2008 and 2009.

Lead is a hazardous air pollutant that is a heavy metal that is particularly harmful to children’s neurological development. It also can cause health problems in adults, including reproductive problems, high blood pressure, and nerve disorders. One of the hydraulic fracturing companies used 780 gallons of a product containing lead in this five-year period.

Methanol is the hazardous air pollutant that appeared most often in hydraulic fracturing products. Other hazardous air pollutants used in hydraulic fracturing fluids included formaldehyde, hydrogen chloride, and ethylene glycol.

V. USE OF PROPRIETARY AND “TRADE SECRET” CHEMICALS

Many chemical components of hydraulic fracturing fluids used by the companies were listed on the MSDSs as “proprietary” or “trade secret.” The hydraulic fracturing companies used 93.6 million gallons of 279 products containing at least one proprietary component between 2005 and 2009.²⁰

²⁷ Clean Air Act Section 112(b), 42 U.S.C. § 7412.


³⁰ This is likely a conservative estimate. We included only those products for which the MSDS says “proprietary” or “trade secret” instead of listing a component by name or providing the CAS number. If the MSDS listed a component’s CAS as N.A. or left it blank, we did not count that as a trade secret claim, unless the company specified as such in follow-up correspondence.
The Committee requested that these companies disclose this proprietary information. Although a few companies were able to provide additional information to the Committee about some of the fracturing products, in most cases the companies stated that they did not have access to proprietary information about products they purchased "off the shelf" from chemical suppliers. The proprietary information belongs to the suppliers, not the users of the chemicals.

Universal Well Services, for example, told the Committee that it "obtains hydraulic fracturing products from third-party manufacturers, and to the extent not publicly disclosed, product composition is proprietary to the respective vendor and not to the Company." Complete Production Services noted that the company always uses fluids from third-party suppliers who provide an MSDS for each product. Complete confirmed that it is "not aware of any circumstances in which the vendors who provided the products have disclosed this proprietary information" to the company, further noting that "such information is highly proprietary for these vendors, and would not generally be disclosed to service providers" like Complete. Key Energy Services similarly stated that it "generally does not have access to the trade secret information as a purchaser of the chemical(s)." Trican also told the Committee that it has limited knowledge of "off the shelf" products purchased from a chemical distributor or manufacturer, noting that "Trican does not have any information in its possession about the components of such products beyond what the distributor of each product provided Trican in the MSDS sheet."

In these cases, it appears that the companies are injecting fluids containing unknown chemicals about which they may have limited understanding of the potential risks posed to human health and the environment.

VI. CONCLUSION

Hydraulic fracturing has opened access to vast domestic reserves of natural gas that could provide an important stepping stone to a clean energy future. Yet questions about the safety of hydraulic fracturing persist, which are compounded by the secrecy surrounding the chemicals used in hydraulic fracturing fluids. This analysis is the most comprehensive national assessment to date of the types and volumes of chemicals used in the hydraulic fracturing process. It shows that between 2005 and 2009, the 14 leading hydraulic fracturing companies in the United States used over 2,500 hydraulic fracturing products containing 750 compounds. More than 850 of these products contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or listed as hazardous air pollutants.

33 E-mail from Peter Spivack to Committee Staff (Aug. 5, 2010).
34 E-mail from Lee Blalack to Committee Staff (July 29, 2010).
Appendix A. Chemical Components of Hydraulic Fracturing Products, 2005-2009\textsuperscript{35}

<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>Chemical Abstract Service Number</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,1-diethylmethylquinolinium chloride</td>
<td>65322-65-8</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3-propane tricarboxylic acid, 2-hydroxy- tri sodium salt dihydrate</td>
<td>6132-04-3</td>
<td>1</td>
</tr>
<tr>
<td>1,2,3-trimethyl benzene</td>
<td>526-73-8</td>
<td>1</td>
</tr>
<tr>
<td>1,2,4-trimethyl benzene</td>
<td>95-63-6</td>
<td>21</td>
</tr>
<tr>
<td>1,2-benzenedithiol-3</td>
<td>2634-33-5</td>
<td>1</td>
</tr>
<tr>
<td>1,2-dibromo-2,4-dioxobutane</td>
<td>35691-65-7</td>
<td>1</td>
</tr>
<tr>
<td>1,2-ethenediamine. N,N' bis [2(2-hydroxyethyl) methylammonio][ethyl]-N,N'- bis [2-hydroxyethyl] -N,N'-dimethy-1-tetradecylamide</td>
<td>136879-94-4</td>
<td>2</td>
</tr>
<tr>
<td>1,3,5-trimethyl benzene</td>
<td>136-67-8</td>
<td>3</td>
</tr>
<tr>
<td>1,6-heptadiamine dihydrochloride</td>
<td>6035-52-3</td>
<td>1</td>
</tr>
<tr>
<td>1,8-diamino-3,8-dioxaundecane</td>
<td>929-59-9</td>
<td>1</td>
</tr>
<tr>
<td>1-hexanol</td>
<td>111-27-3</td>
<td>1</td>
</tr>
<tr>
<td>1-methoxy-2-propanol</td>
<td>97-98-2</td>
<td>3</td>
</tr>
<tr>
<td>2,2'-azobis (2-methoxypropane) dihydrochloride</td>
<td>2997-62-4</td>
<td>1</td>
</tr>
<tr>
<td>2,2-dibromo-3-methylpropionamide</td>
<td>10222-01-2</td>
<td>27</td>
</tr>
<tr>
<td>2-acrylamido-2-methylpropanesulfonic acid sodium salt polymer</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>2-bromo-2-nitropropane 1,3-diol</td>
<td>52-51-7</td>
<td>4</td>
</tr>
<tr>
<td>2-butene oxide</td>
<td>90-29-7</td>
<td>1</td>
</tr>
<tr>
<td>2-hydroxypropanoic acid</td>
<td>79-33-4</td>
<td>2</td>
</tr>
<tr>
<td>2-mercaptethanol (Thioglycol)</td>
<td>60-24-2</td>
<td>13</td>
</tr>
<tr>
<td>2-methyl-4-isothiazolin-3-one</td>
<td>2582-20-4</td>
<td>4</td>
</tr>
<tr>
<td>2-monobromo-3-nitropropionamide</td>
<td>1113-56-9</td>
<td>1</td>
</tr>
<tr>
<td>2-phosphonobutane 1,2,4-tricarboxylic acid</td>
<td>37921-36-1</td>
<td>2</td>
</tr>
<tr>
<td>2-phosphonobutane 1,2,4-tricarboxylic acid, potassium salt</td>
<td>93858-78-7</td>
<td>1</td>
</tr>
<tr>
<td>2-substituted aromatic amine salt</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>4,4'-dimethoxy diphenyl sulfone</td>
<td>80-08-0</td>
<td>3</td>
</tr>
<tr>
<td>5-chloro-2-methyl-4-isothiazolin-3-one</td>
<td>26172-55-4</td>
<td>5</td>
</tr>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
<td>1</td>
</tr>
<tr>
<td>Acetic acid</td>
<td>64-19-7</td>
<td>96</td>
</tr>
<tr>
<td>Acetic anhydride</td>
<td>106-24-7</td>
<td>7</td>
</tr>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>3</td>
</tr>
<tr>
<td>Acetophenone</td>
<td>94-10-0</td>
<td>1</td>
</tr>
<tr>
<td>Acetic anhydride</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Acetylmethylcitrate</td>
<td>77-89-4</td>
<td>1</td>
</tr>
<tr>
<td>Acrylic acid</td>
<td>79-05-1</td>
<td>1</td>
</tr>
<tr>
<td>Acrylamide</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Acrylamide polymer</td>
<td>38113-60-1</td>
<td>1</td>
</tr>
</tbody>
</table>

\textsuperscript{35} To compile this list of chemicals, Committee staff reviewed each Material Safety Data Sheet provided to the Committee for hydraulic fracturing products used between 2005 and 2009. Committee staff transcribed the names and CAS numbers as written in the MSDSs; as such, any inaccuracies on this list reflect inaccuracies on the MSDSs themselves.
<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>Chemical Abstract Service Number</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylate copolymer</td>
<td>818-61-1</td>
<td>1</td>
</tr>
<tr>
<td>Acrylic acid, 2-hydroxyethyl ester</td>
<td>37350-42-8</td>
<td>1</td>
</tr>
<tr>
<td>Acrylic acid, 2-aminoethylmethacryloyl sulfonic acid copolymer</td>
<td>40370-32-5</td>
<td>1</td>
</tr>
<tr>
<td>Acrylic polymers</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Acrylic polymers blend</td>
<td>26006-22-4</td>
<td>2</td>
</tr>
<tr>
<td>Acrylic hydrocarbon blend</td>
<td>124-04-9</td>
<td>6</td>
</tr>
<tr>
<td>Alcohol alkylates</td>
<td>*</td>
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<tr>
<td>Alcohol ethylates</td>
<td>*</td>
<td>2</td>
</tr>
<tr>
<td>Alcohols</td>
<td>*</td>
<td>9</td>
</tr>
<tr>
<td>Alcohol, C11-15 secondary ethoxylated</td>
<td>66131-40-8</td>
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</tr>
<tr>
<td>Alcohol, C12-14 secondary</td>
<td>129900-60-5</td>
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</tr>
<tr>
<td>Alcohol, C12-14 primary ethoxylated</td>
<td>64433-50-6</td>
<td>19</td>
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<tr>
<td>Alcohol, C12-15 ethoxylated</td>
<td>66131-39-5</td>
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</tr>
<tr>
<td>Alcohol, C12-16 ethoxylated</td>
<td>103331-86-8</td>
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<tr>
<td>Alcohol, C12-18 ethoxylated</td>
<td>66551-12-2</td>
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<td>Alcohol, C14-15 ethoxylated</td>
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<td>Alcohol, C11-20 iso C10-rich ethoxylated</td>
<td>78330-20-8</td>
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<td>Alcohol, C9-122</td>
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<td>Alcohol, C9-C22</td>
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<tr>
<td>Aldehyde</td>
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<td>Atdoi</td>
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<tr>
<td>Alkylation aluminia</td>
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<tr>
<td>Aliphatic alcohol polyglycol ether</td>
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<td>Aliphatic amine derivative</td>
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<td>Alkaline bromides</td>
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<tr>
<td>Alkanes, C10-14</td>
<td>93924-07-3</td>
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</tr>
<tr>
<td>Alkanes, C13-16 iso</td>
<td>66551-20-2</td>
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</tr>
<tr>
<td>Alkaline amine</td>
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</tr>
<tr>
<td>Alkanolamine condensate</td>
<td>197980-53-3</td>
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</tr>
<tr>
<td>Alkanolamine chelate of zirconium alkoxide (Zirconium complex)</td>
<td>197980-53-3</td>
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<td>Alkanolamine ethoxylated condensate</td>
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<td>Alkanes</td>
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<td>Alkanes, C10 alpha</td>
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<td>Alkoxylated alcohols</td>
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<tr>
<td>Alkoxylated amines</td>
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<tr>
<td>Alkoxylated phenol formaldehyde resin</td>
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<tr>
<td>Alkyl sulfonate</td>
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<tr>
<td>Alkyl (C12-16) dimethyl benzyl ammonium chloride</td>
<td>66424-85-1</td>
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<tr>
<td>Alkyl (C8-C12) alcohols, ethoxylated</td>
<td>66439-45-2</td>
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<tr>
<td>Alkyl (C9-11) alcohol ethoxylated</td>
<td>66439-46-3</td>
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<tr>
<td>Alkyl alkoxylates</td>
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<td>Alkyl amine</td>
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14
<table>
<thead>
<tr>
<th>Chemical Component</th>
<th>Chemical Abstract Service Number</th>
<th>No. of Products Containing Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkyl amine blend in a metal salt solution</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Alkyl aryl amine sulfonate</td>
<td>255043-08-04</td>
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</tr>
<tr>
<td>Alkyl benzenesulfonic acid</td>
<td>68884-22-1</td>
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</tr>
<tr>
<td>Alkyl esters</td>
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<td>2</td>
</tr>
<tr>
<td>Alkyl hexanol</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Alkyl ortho phosphate ester</td>
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<td>1</td>
</tr>
<tr>
<td>Alkyl phosphate ester</td>
<td>*</td>
<td>3</td>
</tr>
<tr>
<td>Alkyl quaternary ammonium chlorides</td>
<td>*</td>
<td>4</td>
</tr>
<tr>
<td>Alkylaryl sulfonate</td>
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</tr>
<tr>
<td>Alkylaryl sulphonate</td>
<td>27176-93-9</td>
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</tr>
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<td>Alkylated quaternary chloride</td>
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</tr>
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<td>Alkylbenzenesulfonic acid</td>
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</tr>
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<td>Alkylcarnosonium sulfates</td>
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<td>Alkylaminonitrile ethoxylates</td>
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</tr>
<tr>
<td>Aluminate and pyrope garnet</td>
<td>1302-62-1</td>
<td>1</td>
</tr>
<tr>
<td>Aluminum isopropoxide</td>
<td>555-31-7</td>
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</tr>
<tr>
<td>Aluminum</td>
<td>7429-90-5</td>
<td>2</td>
</tr>
<tr>
<td>Aluminum chloride</td>
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<td>3</td>
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<tr>
<td>Aluminum chloride oxide</td>
<td>1327-41-9</td>
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</tr>
<tr>
<td>Aluminum oxide ([alpha]-Alumina)</td>
<td>1344-28-1</td>
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</tr>
<tr>
<td>Aluminum oxide silicate</td>
<td>12068-56-3</td>
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<tr>
<td>Aluminum silicate (multifilite)</td>
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<tr>
<td>Aluminum sulfate hydride</td>
<td>10043-21-3</td>
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</tr>
<tr>
<td>Amides, tallow, n-[3-(dimethylamino)propyl] n-oxides</td>
<td>68847-77-8</td>
<td>4</td>
</tr>
<tr>
<td>Ammonioamine</td>
<td>*</td>
<td>1</td>
</tr>
<tr>
<td>Amine</td>
<td>*</td>
<td>7</td>
</tr>
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<td>Wheat hulls</td>
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<td>Zirconium sodium hydroy lactate complex</td>
<td>113184-20-6</td>
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* Components marked with an asterisk appeared on at least one MSDS without an identifying CAS number. The MSDSs in these cases marked the CAS as proprietary, noted that the CAS was not available, or left the CAS field blank. Components marked with an asterisk may be duplicative of other components on this list, but Committee staff have no way of identifying such duplicates without the identifying CAS number.
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 10:13 AM
Subject: re: review process on hydraulic fracturing in NS

Dear Team of Senior Technical and Policy Staff,

My name is Suzanne Craig.

I would like to voice my concern regarding hydraulic fracturing. Too little is known and too much is at stake. Please, for the sake of your great grandchildren's children I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Thank you, Suzanne Craig
From: Meghann Dunphy
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
CC: "groundwater@ecologyaction.ca" <groundwater@ecologyaction.ca>
Date: 6/4/2011 10:50 AM

Dear Team of Senior Technical and Policy Staff,

My name is Meghann Dunphy

I am from __________________. Not too far from Lake Ainslie where the proposed drilling is 'going' to take place. I grew up around here. It's my home. I have children now, and I want them to enjoy nature, not to take for granted what we have. Some things are more important...there are enough drilling and fracking going on everywhere else, why jeopardize what we have?

We canoe every year up at Lake Ainslie, I wouldn't want that taken away from us. It's a beautiful habitat and home for many. We don't want it harmed.

I am submitting comments relating to the province's review of hydraulic fracturing. Fracking threatens the quality of my water. I want the government to take fracking very seriously, and also consider banning the process completely.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Meghann Dunphy
From: "Terri Brewer"
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 11:09 AM

I have a property for sale a few kilometers from a potential fracking site and I cannot get anyone to even look at it.

Terri Brewer
From: Hermine Ford
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 11:29 AM

June 4, 2011

Dear Senior Technical Team and Policy Staffs:

Lake Ainsley, the Margaree River, the many tributaries, brooks and streams are deeply precious to us. We have, fished, canoed and swam in the Lake and the River for many years. Our spring for all our household water and our brooks are part of the Margaree - Ainsley watershed.

As a resident of New York State I have followed very carefully the fracking issues both here in this state and in other parts of the U.S. This issue has become front page news and the information that is coming out, mostly in headline stories in the NY Times, our paper of record, is not comforting. The least one can say is that not enough is yet known about the near or long term effects of this procedure. Partly that is due to the drilling companies themselves, who for reasons known to them, do not want to divulge every chemical that is used or other details. The possible devastation to surface water, plus soil contamination, elimination of the chemical filled wastewater, threat to the health of people, animals, forests, farmland, natural beauty, all this requires exhaustive study and cautious proceedings. It would be deeply distressing to me, friends, family, and neighbors to have fracking begin on any part of the Cape Breton Island. I urge all persons in decision-making positions to proceed with extreme caution.

Sincerely,

Hermine Ford-Moskowitz
From: Monica Forrestall
To: <frac-review@gov.ns.ca>
CC: 
Date: 6/4/2011 12:47 PM
Subject: PLEASE DO NOT commence fracking in Nova Scotia

Hello,
My name is Monica Forrestall. I am a Nova Scotian, I have a home in the north-west of the province. I have visited the beautiful Cape Breton area many times, and have many, many friends who live there.

The healthiness of ground water is affected during fracking.

The impact of soil contamination is impacted negatively.

I desperately urge you to act RESPONSIBLY and for the long term well being of the people of Cape Breton, not the immediate monetary benefits to the province. Destroying an area in the long term, for money from out-of-province fracking is short-sighted. And once the land is destroyed, what happens to the locals living there for the rest of time.

Thank you for listening.
From: Jean Sawyer  
To: <frac-review@gov.ns.ca>  
Date: 6/4/2011 1:36 PM  
Subject: Review of hydraulic fracturing in shale gas operations in Nova Scotia

To: frac-review@gov.ns.ca  
Re: Review of hydraulic fracturing in shale gas operations in Nova Scotia

All mining and drilling and blasting and excavating has the potential to contaminate our water supply.

Nova Scotia already has serious mine water problems that were the subject of a week long symposium held in Sydney, Nova Scotia in September 2010. One of the presentations was on the threats to our water supply from the April 2010 Call for Proposals for Coal Gasification in Cape Breton for which there are no regulations. Nor are there any regulations for using mine water for geothermal energy, or for building mine water treatment plants, etc.

Just because there's no popular video to capture the environmentalists' imaginations is no excuse to ignore the threats to our water supply from fracking Coal Gas and other extraction methods happening in Nova Scotia no matter what they're mining or drilling for or where.

The scope of the Fracturing Shale Gas Review should also include fracking Coal Gas and serve to protect our water supply from any extraction methods before creating even more toxic water problems than Nova Scotia already has.

Jean Sawyer
From: "Leslie Wade"
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 2:32 PM
Subject: FW: Please help stop Hydraulic Fracturing for "natural" gas

To the frac-review committee, I am forwarding a friend's submission at their request.

Leslie

From:
Sent: Wednesday, June 01, 2011 2:00 PM
To: 
Subject: Please help stop Hydraulic Fracturing for "natural" gas

To whom it may concern (and I hope that's everybody):

Would you please help stop hydraulic fracturing in Nova Scotia and Canada? Let's follow the European example and create a moratorium for the process.

They say the next world war will be fought over water--what hydraulic fracturing does is consume 30,000 gallons per fracture stimulation. I do not give gas companies permission to foul that much valuable water with hundreds of chemical poisons required by the fracturing process. Apparently the Nova Scotia government has given permission to drill hundreds of wells in some of the most beautiful land surrounding Nova Scotia's Minas Basin, as part of this unwanted exploration.

The People's Republic of China, who made their money on the backs of their repressed people, recently gave Encana over 5 billion dollars to co-own fracturing rights in another beautiful part of the country, on the border of B.C. and Alberta. China doesn't care for their own people--do you think they will care about any air and water pollution fracking causes us?

U.S. truckers know places where it is forbidden to cause sparks with their brakes, and know not to even to flick a cigarette out the window, for fear of explosions. The air quality in wide-open-spaces Wyoming is now worse than L.A., due to the many fracking sites there. Some citizens in the U.S., close to such fracking sites, are finding methane in their air and drinking water--causing their bodies to be wracked with pain, disorienting their minds, and causing bone and skin damage. There is nothing nice about volatile "natural" gas--one recently-exploded site in Pennsylvania proves that: and it is natural poison gas for humans working in or near it.

Do I want a moratorium on fracking? You'd better believe it! Would you please help, before it is too late?

Ernie Robinson
From: JAMES HOGAN
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 2:52 PM
Attachments: Fracking.docx
Dear Team of Senior Technical and Policy Staff,

Well water is the only source of water we have on the property.

Contaminated water may render our property unlivable and severely affect the property value.

We use Lake Ainslie for boating, fishing, and swimming. Again we are concerned that these activities may be affected by the fracking operations.

As our residence is on a lot we would be severely affected by heavy truck traffic as we were in the construction of the golf course at Inverness.

We are also concerned about the affect fracking may have on the salmon hatcheries on the Margaree river and the impact of that on tourism to the area and loss of employment in the tourism industry. There is no evidence that there will be any long term job opportunities or financial benefits generated for the area.

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or fracking, and there should be a more transparent public consultation than just public comments.

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Jim and Janet Hogan

June 3, 2011
From: <frac-review@gov.ns.ca>
To: 6/4/2011 3:40 PM
Subject: no fracking in Lake Ainslie

To Whom it May Concern:

I am in the property appraising and real estate business.

I know that Cape Breton has a sustainable business in it's pristeen and natural beauty. People from away come to enjoy this, spend money here to see it and some times move here.

We have been raved about in National Geographic as being one of the 10 most beautiful islands in the world. This would not be the case if we take up placing oil wells throughout the island.

As well, we do not know the long term effects of this type of drilling.

Do the right thing and just say No. We have a collective consciousness and know when we are doing the honerable thing. I have worked out that the so called 10% bennifet to Nova Scctians will have been spent on the infrastructure and will mean absolutely nothing to me and I would gladly forfeet my 10% if asked.

Thank you from a proud Canadian.

R. McAdam
From: Leslie Buckland-Nicks  
To: <frac-review@gov.ns.ca>  
Date: 6/4/2011 4:40 PM  
Subject: comments on hydraulic fracturing review

June 4, 2011

Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8

Dear Team of Senior Technical and Policy Staff,

My name is Leslie Buckland-Nicks, and I wish to express my concerns and comments about hydraulic fracturing, in response to the request by the government of Nova Scotia for input from the public.**

I live in , a rural community dependent on the quality of groundwater for its drinking water. Our community is in a region where healthy, unpolluted streams drain into an estuary that is a thriving ecosystem, providing important habitat for fish such as eels, smelt, seatrout, and Atlantic salmon, and wildlife such as black ducks, great blue herons and muskrats. Our transportation routes tend to follow the waterways, and thus have the capacity to impact these systems when they are either altered, or when accidents occur. In addition, the economy of this Northern Nova Scotia community is tied to maintaining the beauty and integrity of the natural environment. Many of our livelihoods are based on tourism, recreation, fishing, forestry and farming. Development in the natural gas industry, that includes hydraulic fracturing, has the potential to cause great harm to the community and its environment.

I want the government to review the process of hydraulic fracturing for shale gas very seriously, and consider banning it completely. The following are some areas that I find of particular concern.

1. Effects on groundwater: Even though regulations may be in place regarding drilling practices, it is known that accidents involving the cement casings do happen, and contamination of groundwater by the toxic fluids used is a real possibility. It may occur at any level of the well, even though the shale may be much deeper than groundwater.

2. Effects on surface water: Spills, during fluid transport on highways, and at well site, and storage sites are very real dangers from the hydraulic fracturing fluids. The array of toxic chemicals as yet unidentified to the public, would be a nightmare to clean up.

3. Impacts on land, such as potential soil contamination: Spills of fluids, and during transport of natural gas may contaminate soil. How will such soils be cleaned? Who is responsible? How will land owners be compensated?

4. Waste management, including surface ponds of produced waters. Hydraulic fracturing fluids come back up to the surface and the toxic 'waste fluids' must be stored or disposed of. The potential dangers of this aspect of drilling must be addressed.
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids: All chemicals need to be identified, plans for spills transparent, and risks to health and environment explained to public. It is understood that the companies do not release the ingredients of their fracturing fluids.

6. Site restoration: What will be the scale, and who is responsible?

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province: There must be public transparency at all levels of development, and compensation must be fair, if this procedure is allowed to go on.

A review is currently being done in the US by the Environmental Protection Agency. A large number of wells have been drilled and natural gas extracted using the hydraulic fracturing process. I recommend that we not proceed with such development until at least, the EPA’s review has been made public and evaluated.

Many people don’t know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just requesting public comments. I believe that the public consultation process should be approved by the public and include public forums.

Thank you for the opportunity to express my concerns. I urge you to act responsibly when considering the effects of hydraulic fracturing in Nova Scotia.

Leslie Buckland-Nicks
From: Don Wilson
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 6:56 PM
Subject: Review of Shale Gas drilling and Fracking in Nova Scotia

The whole attitude of the review seems to be that you will hear from people just to keep them quiet and so that you are able to say in court that you "consulted" with the citizens of Nova Scotia. Hearing from citizens and filing the comments/requests does not constitute a real review. It may surprise you that some NGOs are very well read and researched people. You would be wise to listen carefully to them and, if they can spare the time, to ask them to sit in on the review process.

It is clear there are presently great risks to both the initial well drilling process, and to the subsequent Hydraulic Fracturing process. These have been evident in the US State of Pennsylvania where the drillers have worked in the same shale formation that we have here in Nova Scotia. Other similar problems have been seen in New Brunswick, Quebec, Alberta in Canada, plus in the US States of Colorado, and in the UK.

In summary: To go forward after this process called a Review would be very risky to all Nova Scotians and to those whose water has been contaminated by the drilling or Fracking. Property values in areas that lost potable water would plummet - this would greatly reduce property taxes that fund municipalities. The displaced persons might move away to another Province thus reducing Income Tax paid, or might end up costing the Province in many other ways.

The movement of water tankers over the fragile roads we have to endure in Nova Scotia will cause great damage that should be paid for by the Drilling companies. Will this be so stated in the drilling agreements signed?

Great care must be taken as to where the Hugh quantity of water required will come from. And even more important, where will the waste water be treated? Will it be well contained? or will it leak off at drill sites as so often has happened. The drillers call that an accident and there are no consequences for them that are costly.

We have seen at many drilling locations that underground aquifers have been contaminated during the initial hole drilling before the hole casing has been installed to a deep depth. This can be mitigated, but will not be done unless there are rules to ensure a process is adhered to that prevents the contamination. A better "best industry practice" will not occur unless the Government of Nova Scotia writes this into drilling contracts.

The contracts already in place in the Kentacook area indicates very little royalty return to Nova Scotians. Considering the possible damages, would the Province be better advised to "wait until better process are proven" and then ask for a real return on ALL gas from each well. "Let the experimenting be done else"where.

The proposed drilling/well site in Cape Breton is ridiculously close to Lake Ainslie and to nearby home(s). Surely another site more remote to both can be found. It may cost the driller more but who are you serving -
the drillers or the citizens?

Finally - are you following the series of articles currently being published in the New York Times regarding shale gas drilling? If not, you should, as there are things that should be looked at carefully as they apply to Nova Scotia. We do not live in a vacuum in this world. Neither should the Ministries of Energy, Environment, Highways and Health.

Don Wilson -
From: Sylvia Fischer
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 8:13 PM
Subject: stop fracking

Dear Team of Senior Technical and Policy Staff,

My name is Sylvia Fischer. For the past fifty years, my family and I have been summer residents of Sight Point, Inverness. We have brought many people to join us in this beautiful, unspoiled countryside. I understand the need to provide people with fuel to heat their homes and run their cars, etc., but not at the expense of desecrating their land and destroying the beauty that exists around them—particularly when there are alternatives like wind and solar power, both sources amply available in this country. I hope there are wise people in this administration who have vision. Thank you.
From: Lois MacLellan
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 8:49 PM
Subject: No to Fracking!

Dear Team of Senior Technical and Policy Staff,

My name is Lois MacLellan

We moved back to Cape Breton from Calgary to enjoy our natural beauty, rivers, streams, lakes and ocean. Very close to the Glenora Distillery, MacLellan's Brook. Black River and the Black River Bog which feeds into Lake Ainsley. This very important water system helps to keep the beautiful SW Margaree River healthy by neutralizing its acidity. My paternal forefathers settled in the Glenville and Deepdale areas and we pay tribute to them with the MacLellan Carin located on land not far from the Distillery and our

where I spent every summer swimming, fishing and crossing to visit my cousins living at

We are familiar with oil and gas activity from our years in Alberta and we don't want to see this kind of activity here. We have two children in school here and we want them to grow up in a safe rural setting.

I am submitting comments relating to the province's review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just public comments.

1. Effects on groundwater - we are on a well and do not want out groundwater contaminated.
2. Use and effects on surface water - what about our wildlife, birds and insects.
3. Impacts on land, such as potential soil contamination - also erosion.
4. Waste management, including surface ponds of produced waters - Where will it go?
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids scares the hell out of us. Do you want to live where these chemicals are so dangerous to our health and environment?
6. Site restoration Can it ever be restored? Is it worth it?
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province? Who is responsible? How many jobs will really be created locally?

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Lois MacLellan and Family
From: Jane Terry
To: <frac-review@gov.ns.ca>
Date: 6/4/2011 10:00 PM
Subject: Stop fracking

Gentlemen,
The idea of even considering fracking in my mind is unthinkable. It should never have been invented. It was invented for one simple reason, greed.
You put poison into the earth, get half back and then say it is fine? What are you thinking? Where does the other half of the poison go? Yes you guessed it. It is still in the earth for years and years to poison: our water table, wildlife, forests, farms (where your food and mine come from), and oh, yes, US!
If there is no water, there is no life. No amount of money can compensate people for their quality of life, if they can still live on the land they bought and paid taxes on. All for the sake of a big company getting richer on the backs of the people that use their product. If they would only realize that some of us are only going to and from work and maybe one larger trip a month because they cannot afford anything else.
Yours truly, A concerned Nova Scotian that hopes to live here healthy for many more years
From: "Gail Morris"
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 9:35 AM
Subject: PLEASE!!!

Take the time and resources to further review the environmental impact of Fracking for natural gas in NS

We do not need this industry and we have evidence from other areas that it is not a safe method and that it has a negative effect on the environment.

The potential profit is not worth the cost to our province---our clean air and soil and water and the health of future generations!!!

Gail Morris, FRI

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Please consider the environment before printing this e-mail
From: Scott Macmillan
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 9:50 AM
Subject: Among the fracking mad

To those on the review process:

To speak of the science and documented cases of environmental disasters associated with the fracking process I think could be redundant. There are too many verified instances of pollution to water with fracking for me to site and many people submitting will have those resources handy.

For me Nova Scotia is arguably the BEST PLACE in the world to live. Yes we do have environmental problems like everyone else, but I drink pure water from my well. The thought of using our precious water resource to such risky business and deliberately polluting the water to harvest gas to the surface and leaving us with pools of polluted water on the surface will NEVER sit well with me. I have yet been shown the economic advantage. Can someone give me the dollar value of pure water??

What I see with such pressure to get our energy resources in this fashion is a desperation world-wide, as we reach peak oil. This is a huge problem, and we need courageous leadership and imaginative innovation to get us through. Reacting to this Goliath of industry pressure I believe will degrade our life situation, yes, create a FEW jobs and leave our home seriously more polluted. Once the “industry decided” chemicals are pushed into the ground one can’t get it out, would you drink water near one of these sites?

We have an opportunity here in Nova Scotia to be a “David” in the “Goliath” of the world energy situation, we have a beautiful home NOW let’s not let it slip between our fingers. If this review process can carry any weight in persuading our decision makers to put a halt to fracking I deeply hope it happens. I will ALWAYS be among the fracking mad!!

Scott Macmillan
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 9:53 AM
Subject: STOP

Why would an sane person even consider allowing this in Nova Scotia. In my opinion a study is not required unless of course one wants to waste more tax dollars; just do not allow this to happen.

P.G. Comeau Appraisals
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442, Halifax, NS, B3J 2P8

By e-mail: frac-review@gov.ns.ca

Dear Team of Senior Technical and Policy Staff,

I appreciate the opportunity to provide written comments on the scope proposed for a provincewide review of fracking. Although I live within the Windsor Block, for which Triangle Petroleum has a production lease, I had not been aware until recently that fracking had been used in some wells in Hants County and that it is being considered for more sites. Although I attended the Open House in Summerville in 2009, there was no public mention and/or explanation of fracking during the time (almost 2 hours) that I was present. Others who gave permission for seismic testing didn’t seem to realize that the next step could involve fracking. If fracking is even being considered for an area, the first condition should be open public consultation with members of the communities.

After learning about this opportunity for input, I’ve checked on information about fracking taking place in other areas. I am extremely concerned about the numerous serious consequences reported.

On Feb. 26, 2011 The New York Times reported that waste water from fracking is sometimes hauled to sewage plants not designed to treat it, and then discharged into rivers that supply drinking water. The water was found to contain radioactivity at levels higher than previously known, and far higher than the level that federal regulators say is safe for these treatment plants to handle. With uranium naturally occurring in this area of the province, there is potential for radioactive particles to be present in the waste water of any fracking done in this region. I’ve been informed that we do not have water treatment plants in NS that can handle radioactive waste.

This raises questions such as:

Where would waste water be treated?

What safeguards would be in place if the vehicle was in an accident?

What is the source of the water?

What limits are on quantities used?
NS currently has some of the highest rates of cancer in the country. People in this area are being encouraged to participate in the 'Atlantic Path- Partnership for Tomorrow's Health' study. Water testing is part of this study to determine if exposure to arsenic and other chemicals may be a factor in the development of cancer and other diseases. It seems extremely counterproductive to allow millions of gallons of water containing chemicals to be injected into our ground, that will in turn result in waste water that may contain arsenic and/or radioactive particles, along with numerous other chemicals.

Like many in rural NS, people in our local communities rely on well water for drinking. After reading the Duke study that was published in the Proceedings of the National Academy of Sciences in May 2011, I have to wonder if decision-makers have really studied the ramifications for us in their consideration of the use of fracking in NS.

Research conducted by four scientists at Duke University found that levels of flammable methane gas in drinking water wells increased to dangerous levels when those water supplies were close to natural gas wells. The water samples taken closest to the gas wells had on average 17 times the levels detected in wells further from active drilling. They also determined that the type of gas detected at high levels in the water was the same type of gas that energy companies were extracting thousands of feet underground. This indicates that the gas could be seeping underground through natural or manmade faults and fractures, or coming from cracks in the well structure itself.

This research adds validity to Dr. Anthony Ingraffea's view that joints will open in unpredictable ways when fracked. Dr. Ingraffea, who has a PhD in Rock Fracture Mechanics, points out that fracking is really re-fracturing existing fractures. His theory easily explains why water samples taken from wells closest to gas wells would have higher levels of methane. It also gives a reasonable explanation for 'communication incidents', where fracking materials injected in one well show up in another. Several of these incidents have been reported from British Columbia.

The importance of clean and available water cannot be overstated. A recent poll by the Canadian Union of Public Employees found that 87% of those surveyed believe that "water is our most precious resource" and government needs "to ensure that we retain public control over water" (The Chronicle Herald, June 4/11).

The scope of this review on fracking needs to be much broader and needs to include the effects of fracking on air quality and health. In the small town of Dish in Texas that has a high concentration of shale gas wells, the air quality was tested after a large number of residents started getting sick. The air was found to contain high levels of cancer-causing chemicals. Follow-up blood testing revealed those same chemicals present in levels above the currently acceptable levels in half of the people assessed. It was determined that these carcinogenic chemicals were in the 'slickwater' used when fracking.

A study by Theo Colborn et al confirms the presence of these chemicals in the list of
those used and produced in drilling and fracking in “Natural Gas Operations From a Public Health Perspective”. It will be published this fall in the International Journal of Human and Ecological Risk Assessment. The potential health effects of the 353 chemicals identified by Chemical Abstract Service (CAS) numbers were assessed. They found that more than 75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40-50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations. They also discussed unpredictable delayed, life-long health effects on individuals and/or their offspring, and I quote:

“Industry representatives have said there is little cause for concern because of the low concentrations of chemicals used in their operations. Nonetheless, pathways that could deliver chemicals in toxic concentrations at less than one part-per-million are not well studied and many of the chemicals on the list should not be ingested at any concentration. Numerous systems, most notably the endocrine system, are extremely sensitive to very low levels of chemicals, in parts-per billion or less. The damage may not be evident at the time of exposure but can have unpredictable delayed, life-long effects on the individual and/or their offspring. Effects of this nature would be much harder to identify than obvious impacts such as skin and eye irritation that occur immediately upon contact. Health impairments could remain hidden for decades and span generations. Specific outcomes could include reduced sperm production, infertility, hormone imbalances, and other sex related disorders. Further compounding this concern is the potential for the shared toxic action of these contaminants, especially those affecting the same and/or multiple organ systems” p.11.


Ministers Parker and Belliveau have stated, “We understand Nova Scotians want assurances from their government that our drinking water is safe and our environment is protected. That is why it is important that we make decisions based on facts and science for the recommendations before making a decision on the future of shale gas hydraulic fracturing, I can assure all Nova Scotians that if a proposed activity has not demonstrated that it can be done right, it will not be approved.”

The number of independent scientific studies and documents indicating detrimental environmental and health effects from fracking is growing. I believe that: a strategic environmental assessment is needed to determine the short and long-term risks of fracking. It should assess not only the risks and costs from environmental and health effects, but include the economic impacts on agriculture and tourism, and a true and complete accounting of greenhouse gas emissions involved in the total process. Full public consultation is imperative. I believe that a moratorium should immediately be put in place as science already shows the potential for irreversible damage from fracking.
This decision on fracking presents an opportunity for government to think proactively and keep our provincial environmental and health costs in check. Using the precautionary principle and prohibiting practices such as fracking, that put our water resources and health, and those of future generations at risk, would be a huge step in the right direction.

Respectfully submitted,
Barbara Gallagher

cc: Chuck Porter, Hants West MLA
Andrew Younger, Liberal Environment/Energy Critic
Allan MacMaster, Conservative Environment/Energy Critic
From: Jennyfer Brickenden
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 11:13 AM
Subject: Please do not approve Fracking in NS

Dear Team of Senior Technical and Policy Staff,

My name is Jennyfer Brickenden. I am not someone who has written many letters, but the issues around Fracking in Nova Scotia strikes such a deep core in me. It touches on our whole way of thinking about our environmental and energy future and I feel compelled to write you at on review process committee.

I am from Halifax with a home also in the designated Ainslie Block in Brook Village, Inverness County Cape Breton. I am so deeply concerned about Hydraulic Fracking and strongly support a moratorium on Fracking in Nova Scotia. There has already been activity in the Windsor area of NS and now oil companies are seeking approvals to potentially expand their sights with their lease here, the Lake Ainslie Block.

There has to be another vision to economic growth for the province that doesn't play into the old card of being forced to put up with any type of industry no matter how damaging because we are a 'have not' or 'underemployed' region. This mentality only helps to limit our thinking, creating a sense of economic desperation subjecting Nova Scotian's to a continuum of, in my mind, poor decisions like the call centre that pull after they have used up their government subsidies.

Hydraulic Fracking is an inconvenient energy resource where for each fracked well there is 4 million gallons of water used mixed with a toxic cocktail. And at that, each well is Fracked repeatedly, using untold amounts of precious NS water, an absolute necessity of all life forms including human.

Where does this water come from to be used in the fracking process? Where does it go after it has been destroyed from the fracking process? Do we need another Sydney Tar Ponds to clean up?

Anyone who has ever dealt with water knows it unpredictability. Sometimes it doesn't go where you expect it. The multiple blasting required for fracking a shale seam is first and foremost to break the shale apart to access the gas. There is no way these companies can be sure that the shale they are fracking, fracks the rock in predictable ways thus putting at risk all surrounding water resources.

Will this government demand that ALL wells in the leased area be offered a wide ranging water assessment (more than just a base line test) of their current well quality AND paid for by these drilling companies?

What about the roads? Are these companies going to be forced to maintain our small country roads to handle the heavy machines and trucks that will create massive wear and tear on our roads. Will I the tax payer be footing that bill when my car's bottom has been ripped out from the ruts that this heavy machinery will bring to the
road system?

Who and what do we want to be in Nova Scotia? I have lived and travelled the world. I have spent years setting my life up to be able to be here and live in one of the most amazing places on the planet. Yet year after year I also live with and have to pay my provincial taxes to governments that support businesses that are either transitory as in the call centres or corporate driven and poorly regulated, resource extracting industries, that put at risk all the natural attributes that make Nova Scotia so amazing.

For the few weeks and for the potential damage that could be caused by Petro-worth’s drilling of their test well at the Lake Ainsle Block, the economic benefits are paltry, compared with the economics of what Celtic Colours International Festival generates in a similar time period, without the massive structural and potential environmental damage. These people come to share in the beauty and culture that makes Nova Scotia/Cape Breton so special and with miniscule amount environmental damage and a huge impact on the local economy.

I am fully aware that convenient sources of energy are drying up. It becomes an easy out to look at the oil industry, with all their promises of wealth and royalties, but be real, they are out the make sure their shareholders are satisfied with their returns first and foremost and you the regulator, me the citizen or our province itself takes a back seat to this corporate drive.

If you the ‘New’ Democratic Party cannot act on behalf of the people who elected you to democratize our energy base to a more sustainable future who as a citizen of this province do we look. We could dramatically reduce our need for energy resources, if, instead of giving subsidies for large invasive industrial projects, direct subsidies were given to individual homeowners right across this province to solar or otherwise retrofit their homes and become energy suppliers to the grid through Feed in Tariffs.

Nova Scotia and this government could be a leader in truly democratizing our energy needs, how it is created and subsequently how it is used. We have such an opportunity being the small and amazingly beautiful gem on the earth to abandon these destructive industries. They make promises of wealth at a tremendous risk to our health, natural uniqueness, and our limited financial resources, should these profit driven corporations compromise our environment in any way.

We must put the oil industries hungry drive for more and more of our Nova Scotian resources, at any cost, on hold. Let’s get off this destructive train while we can and fracking ranks right up there with some of the worst. Let’s take a real and honest look at what other parts of the world are doing regarding empowering their people to power their communities with home installed systems and become a leader in renewable, innovative and democratic power sources.

Because the bottom line is that no matter how you slice it Without environmental security there CANNOT be economic security.
I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

Yours sincerely,

Jennyfer Brickenden
From: "Kathy Kenrick"
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 11:38 AM
Subject: Fracking on North Shore

I would like to make the government aware that any review or study of fracking along the north shore or anywhere else in Nova Scotia, should be a complete and comprehensive review. Any review should be completely independent of government, and should involve public consultation. The potential exists for governments to profit significantly from fracking for shale gas. Therefore, any stakeholder that stands to profit should be independent of the review. I believe the potential for harm significantly outweighs and short-term financial gain. The list of possible harms that may occur is long and complex and the government authorities have heard this list from many protestors already, so I won't repeat. Let me just add my voice to the many who want any review to allow for all possible outcomes, including an outright ban on fracking and should include public consultation.

This review needs to be more broad-based than the government asking for best industry practices. The government needs to accept the possibility that a total and complete ban on fracking may, in fact, be the right and correct answer.

Thanks for your consideration of my opinion.

Kathy Kenrick
From: mary costello
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 11:45 AM
Subject: No To Fracking

Absolutely no way should this abomination be allowed in Nova Scotia. Once again the greedy oil interests want to bleed us dry and leave Nova Scotia suffering the consequences for generations to come. Will we ever have a government that really looks after the long term well being of our province over the questionable short term gain.

Mary Costello
From: "Michael Barton"
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 9:37 AM
Subject: Fracking in Nova Scotia

I am writing in to express my strong opposition to allowing fracking anywhere in Nova Scotia.

I would normally be an NDP supporter but this government has been listening to the bureaucrats NDP and not to voting public. That is not a very canny move politically I might add.

As the fossil fuels run out, there will be more and more bizarre and desperate attempts to get more. At some point a line has to be drawn. Fracking is one such approach and the disadvantages outweigh any benefits (indigenous energy source etc.).

By the way your so called "fact" sheets are shocking examples of bureaucratic misrepresentation. The examples given were carefully chosen to favour one outcome and so on....

Yours Sincerely
Michael I Barton
From: "valerie brown"
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 9:38 AM
Subject: fracking

We have lived in this wonderful province and thrived long before fracking, we will continue to do so without it. Do not let them ruin our beautiful coastline, destroy our pure water, upset rural communities full of history, mar our landscape. We can and will be beautiful, more beautiful without them. We don't need their contaminated water, dirty money, lies and deceptions.

Keep our lands free from carcinogens at all cost. Human life is worth more than billions of gallons of natural gas. Where is our future if we don't have the minds to think it, do it, create it. We don't want brain cancer ruining the minds that could create a better future, a sustainable future, for our province.

Stop fracking, don't give fracking a chance to get started!

No fracking way!!!

Valerie Brown
From: "Steve Harder"
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 9:51 AM
Subject: Oppose fracking

This is a Submission to Review of hydraulic fracturing in shale gas operations in Nova Scotia

We live in West Branch, Pictou County, and we definitely oppose any fracking in the province. There are many reasons for this, but in its simplest form the environmental risks—particularly to our water supply—far outweigh any potential economic benefits.

Steve and Deborah Harder
From: Catherine Pross
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 1:36 PM
Subject: ban hydraulic fracturing

To: frac-review@gov.ns.ca

Re: Hydraulic Fracturing Review

Nova Scotia should place a ban on hydraulic fracturing using current technology.

Royalties received by the Nova Scotia government in return for access to shale gas will not be enough to cover the costs of injury to Nova Scotians and Nova Scotia caused by hydraulic fracturing.

The above statements are backed up by four recent studies based on scientific research showing damage to the environment, our drinking water, our health, and enormous contribution to climate change. They are all available on the internet:

*Will natural gas fuel **America** in the 21st century?* By J. David Hughes, 2011. *David Hughes is a geoscientist who has studied the energy resources of Canada for nearly four decades, including 32 years with the Geological Survey of Canada as a scientist and research manager. He developed the National Coal Inventory to determine the availability and environmental constraints associated with **Canada**’s coal resources. As Team Leader for Unconventional Gas on the Canadian Gas Potential Committee, he coordinated the recent publication of a comprehensive assessment of **Canada**’s unconventional natural gas potential.*


*Chemicals used in hydraulic fracturing*. April, 2011, for the US House of Representatives Committee on Energy and Commerce.

*Natural gas operations from a public health perspective*.

By Theo Colborn, Carol Kwiatkowski, Kim Schultz, and Mary Bachran

Accepted for publication in the *International Journal of Human and

The conclusions of these important studies should be carefully considered.

Yours truly,

Catherine Pross
From: Barbara Harris
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 2:18 PM
Subject: submission to scope review
Attachments: SFNS fracking scope submission.doc

"We know there are significant risks associated with ... the pollutants involved in fracking," says Dr. Anthony Ingraffea, a rock-fracture mechanics expert at Cornell University. "These drilling techniques result in amounts of toxic matter so large – in solid, gas, and liquid states – that, in effect, everybody is 'downstream.' You can't get far enough away."

This submission is made on behalf of No Fracking in Nova Scotia, a grouping of citizens along the North Shore of Nova Scotia, including Pugwash, Wallace, Tatamagouche, River John, Caribou and Scotsburn.

In response to the question, is the scope of this review sufficient, our answer is definitely NO.

We do not believe that the process outlined is a review of fracking. It appears to be merely a review of regulations relating to fracking, with a stated outcome "to make recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province."

The scope of the review should allow for all possible outcomes, including the outcome of banning fracking because it poses serious risk of immediate and long-term harm. A review which is not is open to all outcomes and does not evaluate all risks is not a real review.

We believe fracking poses such serious risks to the environment, to health, to rural communities, and to sectors of our economy, that it needs an in depth independent assessment, not merely an in-house review of regulations. We believe that industry and regulatory best practices are not sufficient to protect against long term, serious and irreversible damage. Fracking has the potential to cause damage so extensive that the long-term impact is just beginning to be revealed by independent, peer-reviewed science.

Nova Scotia's "Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia" as presently defined skips over the essential question, "Should fracking be allowed in Nova Scotia, or are the risks too great to allow it." The scope of any evaluation of fracking must start from this crucial question.

Any evaluation of fracking must be firmly based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, because evidence indicates that fracking has the potential to cause long term, serious and irreversible damage. The

Environment Act states, "... the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation." If there was ever a case for applying the precautionary principle, this is it.

We also believe that fracking, however it may be done, breaches many of the other principles of Nova Scotia's Environment Act, including the principle of sustainable development, the principle that maintaining environmental protection is essential to the integrity of eco-systems, human health and the social-economic well being of society, the principle of ecological value, preservation and prevention of loss of biological diversity, the principle of pollution prevention as a foundation for long term environmental protection, and the principle of shared responsibility of all Nova Scotians to sustain the environment and the economy.

A real evaluation of fracking, with the objective of protecting Nova Scotia's people and environment must include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term. The scope of the review, which looks at water and soil, omits a number of important areas, including

- environmental impacts on air quality,
- environmental impact on forests, wildlife, and sea life,
- health impacts, both immediate and long term, including respiratory damage and disease, cancers, and endocrine disruption, as well as mental health impacts
- economic impacts on tourism, farming, fisheries, property values,
- impact on in-migration and immigration,
- consideration of the specifics of Nova Scotia's geology, including the existence of areas with extensive mining, both legal and bootleg, which will not all be mapped, and the increased risk in these areas, including the potential impact of earthquakes, and
- socio-economic impacts on rural communities in particular the industrialization of rural communities including noise and light pollution, heavy traffic, wear and tear on roads and bridges, and the risk to local economic development and priorities
- impact on rural quality of life including the destruction of clean air, tranquility and natural beauty

Evaluation of impacts must consider the cumulative risks and impacts of multiple wells, multiple fracks in each well, and include the various components of a shale gas fracking operation.

Important facts about the risks and impacts of fracking, which have been hidden for years, are just beginning to come out. Freedom of information requests such as those done by the New York Times which resulted in the Drilling Down series², have unearthed facts previously hidden from the public. Independent, peer reviewed
science is beginning to be published. Evidence is mounting that shows that many industry claims of safety are hype, not fact.

According to Dr. Ronald Bishop, Professor of Analytical Chemistry at State University of New York at Oneonta, "...even if you adopt industry’s definition of hydraulic fracturing (thus excluding incidents from drilling damage, failed well casings, spills, erosion and sedimentation, or tanker accidents), there is now evidence...that the isolated process of hydraulic fracturing has been responsible for water contamination."³

The situation is so serious in the US that the State of New York, which itself has imposed a moratorium on all fracking, has just initiated a lawsuit against the federal government due to the risk to New York of fracking in neighboring states, saying that regulations [proposed by the Delaware River Basin Commission] should not even be considered until the environmental impact of the drilling has been studied.⁴

The Worldwatch Institute reports that although hydraulic fracturing has become the focus of much controversy, "the most significant environmental risks associated with the development of shale gas are...gas migration and groundwater contamination due to faulty well construction, blowouts, and above-ground leaks and spills of waste water and chemicals used during drilling and hydraulic fracturing."⁵

Nearby waterways, domestic wells and underground sources of drinking water (USDW) such as underground aquifers have become contaminated across the US due to poor industry practices and incomplete knowledge of underlying rock formations.⁶

An internal document from Pennsylvania’s Department of Environmental Protection outlines over 60 instances of water contamination and fugitive methane migration from gas drilling operations, many of which were due to unexpected pockets of underground pressure, the failure to contain well pressure, faulty production casing, or the accidental drilling into other abandoned or producing gas wells.⁷

With evidence like this, it is clear that regulation cannot provide sufficient protection to drinking water and other impacts on health and environment. Too

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² Drilling Down series, NY Times
Link to part one, which contains links to the other parts of the series, and to documentation on which the series was based, including 30,000 pages of information obtained through FOI.

³ DeSmogBlog Interview with Dr. Ronald Bishop. February 23, 2011.
⁶ http://www.mediafire.com/?skdec6nfa1h0300
⁷ http://www.mediafire.com/?skdec6nfa1h0300
much is unknown or unpredictable, too much can go wrong.

The US EPA review of fracking is likely to reveal important information about fracking, but preliminary results will not be in until late 2012, with a final report due in 2014. How can Nova Scotia make responsible decisions about fracking by early 2012, when so much critical information is still unknown?

Citizens on the North Shore believe now is the time to take a big step backwards on fracking, not rush ahead. How can a review make decisions on how to proceed with fracking, when the facts about long term and immediate risks are still unknown? **Industry assertions are not facts.** Industry promises of protection have been shown time and again to be illusions. The risks are too serious to move ahead.

We believe there is enough evidence to ban fracking outright at this time. If the information available does not convince the government of this then, at the very least, the only sensible solution is a complete moratorium on fracking in exploration and development for a minimum of 5 years, with a commitment that such a moratorium would only be lifted if it can be proven that fracking will not harm the environment, health, or quality of life.

We urge the government to amend its limited, in-house review of fracking, apply the precautionary principle, and move to a ban or moratorium on fracking until independent evidence shows that it is safe. We believe this approach will make Nova Scotia a richer province in the long run than pursuing short term gain at the risk of serious, irreversible environmental and social damage. Preventing damage to our province by learning from the mistakes of others is basic common sense.

Respectfully submitted,
Barb Harris on behalf of the Steering Committee,
No Fracking in Nova Scotia, North Shore
June 5, 2011
Box 94, River John, NS B0M1X0
902-351-2490
From: Elizabeth Fajta
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 6/5/2011 2:41 PM
Subject: Fracking Review Submission

Please find my comments attached.

E. Fajta
From: Elizabeth Fajta
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 6/5/2011 2:47 PM
Subject: Corrected Submission is in attachment
Attachments: Frackingsubmission.doc

This should contain my submission as an attachment of 2 pages - I believe my email of 2 minutes ago didn't have the attachment.

Thank you.

Elizabeth Fajta
From Elizabeth Fajta

June 5, 2011

Just as I was heartened by the Nova Scotia Government’s stand on halting uranium exploration I was heartened that the Nova Scotia Government Departments of Energy and Environment, on April 4, 2011, announced a review of the environmental issues associated with hydraulic fracturing for shale gas.

We need responsible stewardship of our land, water and air, and I trust the province of Nova Scotia will listen to our concerns.

I understand that the province has already allowed Elmworth Exploration/Triangle to drill five test wells to date (and four of them have been fracked) in the area known as The Windsor Block. This is an area I consider my backyard. What has been happening there I do not want to happen in anyone’s backyard.

Even drilling these test wells must stop. The dangers inherent in this process are legion: millions of gallons of water that is used, mixed with undisclosed quantities of chemicals (including benzene and toluene – these are carcinogenic); millions of gallons of water with those chemicals that is retrieved but which now also, since we’re speaking of Nova Scotia, likely is now contaminated with arsenic and uranium (Where was this contaminated water disposed of?). What happened to the million gallons plus chemicals which stayed in the ground? That’s our precious water table that’s being put at risk. Other submitters will likely provide you with the exact quantities in question. I hope you will notice the magnitude of those quantities.

Shale gas oil is as dirty as Alberta’s tar sands. Consider the damage caused by all the trucks needed to cart that much water to and from the well sites, the industrialization of our landscape (goodbye tourism); the potential for damage to the Bay of Fundy (goodbye fisheries); the damage to our drinking water (you can’t drink natural gas).

And to further the insult to Nova Scotians Triangle Petroleum flaunts its lack of concern for what’s good for Nova Scotians by boasting on its website that “new fields may qualify of a two-year royalty holiday”! Given that shale gas wells have short life spans Nova Scotia might receive no royalties whatever as a result. The number of jobs to be created is so small the figure doesn’t even appear in Triangle’s proposal on its website. In addition it will not be our natural gas but gas this is destined to go to the northeastern United States. To destroy our environment for so little benefit to us makes no sense at all.

I recommend that the Departments of Energy and the Environment have a good look at the documentary “Gaslands” and decide if the irreversible damage done to the people, the animals, the water, air and landscape depicted there are what they want for Nova Scotia.

Given the harm it will cause (on top of the harm the test drilling has already caused) it just is not worth it, no matter how ‘economical’ hydraulic fracturing makes the extraction of shale gas.
Please think of the welfare of Nova Scotia and Nova Scotians. You did the right thing with regard to halting uranium exploration. Now you have the opportunity to do the right thing again – put a stop to any further exploration for shale gas by hydraulic fracturing.

Thank you.

Sincerely,

Elizabeth Fajta
From: Jan Watson
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 3:08 PM
Subject: Re: submission to scope review

Bravo! Well done
:-)
Jan
From: <frac-review@gov.ns.ca>, <jimmorton@kingsnorthmla.ca>
To:       
Date: 6/5/2011 5:21 PM
Subject: fracking in Nova Scotia

Dear Jim Morton:

I am writing to urge your government to place a moratorium on “fracking” in Nova Scotia. The EPA is currently conducting an analysis of the health and environmental risks associated with hydro-fracking and expects to release preliminary results in late 2012. It would be prudent to wait for these results before considering fracking in Nova Scotia.

The EPA estimates one well in a coal bed can require anywhere from 200,000 litres to more than 1 million litres while a horizontal well in a shale formation can use between 7.5 million to 19 million litres of water. Is this really what we want to do with our precious Nova Scotia drinking water?

Shale gas is terrible in terms of global warming. Shale gas is “clean” only when it is being burned. The process of getting it is definitely “not clean.” An abstract of a recent Cornell University study by RW Howarth et al stated “The footprint for shale gas is greater than that for conventional gas or oil when viewed on any time horizon, but particularly so over 20 years. Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20 year horizon and is comparable when compared over 100 years.”

I urge you to initiate an independent evaluation of fracking that would allow for full public participation and access to information. An improved version of the Voluntary Planning Group would be a good idea.

When it comes to fracking, there are so many environmental concerns:

* Water use: the process uses large amounts of fresh or potable water.
* Waste disposal: space is needed to store the waste water safely; sometimes, this involves clearing trees or disrupting habitats. The waste water must be treated at facilities that critics say are not always equipped to remove the contaminants particular to hydro-fracking.
* Contamination: the fear is that the chemicals used and released during fracking contaminate drinking- and groundwater — either during the process itself or through the waste water that is recycled and used afterward. The substances released along with the natural gas can continuing leaking from the well for decades after the extraction process.
* Air pollution: some of the methane gas being extracted during fracking escapes or is vented at the well head during the process and contributes to greenhouse gas emissions. In addition, some people living near fracking wells have complained of noxious fumes that they say cause headaches, nausea and other symptoms and that they attribute to some of the substances released during fracking, such as benzene and toluene.

Brad Walters is a professor of geography and environmental studies at
Mount Allison University and is internationally recognized as a scholar on the human dimensions of environmental change. On September 9, 2010, he stated "Government and industry assurances that there are no proven risks associated with hydro-fracking miss a critical point: the deployment of this technology is relatively new and potential environment and health effects have simply not yet been carefully evaluated.

In fact, in a troubling demonstration of the former U.S. administration of George W. Bush's unwavering allegiance to oil and gas industry interests, hydro-fracking was given exemption in 2005 from U.S. federal air and clean water regulations, just as the technology was poised to take-off in the United States.

This is a major reason why so little formal assessment has been done on the impacts of hydro-fracking."

Regards,
Valerie Goldin, M.D.
From: Coralie Cameron
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 6:12 PM
Subject: Review input

June 5th, 2011
Dear Team of Senior Technical and Policy Staff,
My name is Coralie Cameron and
I have grown up enjoying what the River and Lake have to offer, learning to swim and canoe at the Lake, and learning to fish and swim in the River. Over the years I have used these bodies of water for recreation, employment in the tourism industry, and food which my family fishes for on an annual basis, and has been doing so for over one hundred years. I am submitting comments relating to the province's review of hydraulic fracturing. Fracking threatens the quality of my water. I want the government to take fracking very seriously, and also consider banning the process completely. Any damage done to Lake Ainslie and the Margaree River will create irreversible damages to the fishery, as well as the tourism industry, and the ecosystem and the watershed in general. When the concept of hydraulic fracturing came to my attention last year, I decided to find out as much as I could about it so that I could make an informed decision on the benefits and the implications of this technology. It is very obvious to me through my research that this is a practice that has serious and harmful implications to the environment and should be banned in this province. The industry admits there are risks and that there is damage being done, and people all over the world are also recognizing the harm being done by this practice. I feel that we should never allow a practice to go ahead simply because it is the quickest and easiest way to do something. I would like to live in a Province that puts time and effort into developing the most sustainable energy systems it can, rather than jumping on an industry-led bandwagon.

In the review being carried out by the Province, I hope that all letters that have been send to the Minister of Environment and Minister of Energy are read and taken into account. I also hope that other Provincial and State studies that have been done across Canada and the USA. I wish for the review team to consider how many other jurisdictions have banned or placed a moratorium on hydraulic fracturing and to understand that a ban is the best option for this region. Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia, and to not ignore what the citizens of this Province are urging you to do.
Sincerely,
Coralie Cameron

"Hope is like a road in the country; there was never a road, but when many people walk on it, the road comes into existence."
-Lin Yutang
From: kathleen donovan
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 6:48 PM
Subject: inquiry into natural gas production in NS

Please find attached my letter to you regarding the scope of the review into gas exploration in Nova Scotia.
Kathleen Donovan
June 4, 2011

To Whom it Concerns:

RE: Review of Hydraulic Fracturing for Natural Gas

I am writing to object to the limited scope of your government's upcoming inquiry, which omits the most essential question to me and my neighbors: that is, should fracking be allowed in Nova Scotia? The result of the review should not be limited, as it currently is, to "make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." Regulation is not the issue.

As a resident of [ Triangle N-14-A] already with disastrous consequences. Of these wells, one typically 5 to 6 million litres - were not recovered. According the company, the lost fluids must have gone into a fault. At a typical 2% of chemicals and solvents classified as hazardous wastes, that would be about 100,000 litres that went somewhere.... less than 500 metres from the Department of Natural Resources identified ‘rich wetland’ of Noel Lake.

The fracking process involves other serious risks, now well documented. These include negative impacts upon the water, soil, air, forests, and wildlife; health problems including cancers, endocrine disruption and respiratory damage. In addition, such exploration would have a negative impact on our property values and be a major disruption to the unique way of life in our rural communities.

Nova Scotia should learn from other jurisdictions, such as Quebec and New York State, where a more cautionary approach has been taken toward such gas developments. Both jurisdictions have placed moratoriums on such development pending further study.

There should be a public inquiry in many communities across the province, wherein the people would have ample opportunity to express their views, rather than this limited inquiry with its short timelines.

Sincerely,

Kathleen Donovan
From: JOEL ROGERS
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 7:18 PM
Subject: Hydraulic Fracturing Review

To The Review Panel: The scope of the review should consider all environmental and social aspects of fracking. Water is not the only aspect to consider. There will be massive increase in truck traffic that will tear up the roads. Increase fragmentation of wildlife habitat, more air pollution, the potential for fracking induced earthquakes. An activity that will cause irreversible environmental damage cannot be regulated into harmlessness. Injecting poisons into the ground just is not a sensible concept. Any review of fracking should be done independent of government and should start with the precautionary principle and allow full public participation. If the money that is being spent to chase the last hydrocarbons was spent on reducing our energy use and establishing renewable energy sources. We would be better off in the long run. Joel Rogers,
From: bob unger
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 8:54 PM
Subject: Review of Fracking

Please see our letter attached.
Nancy Bird & Bob Unger
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442 Halifax, NS, B3J 2P8
June 5, 2011
frac-review@gov.ns.ca

Dear Team;

My husband and I would like to comment upon the review of hydraulic fracking in Nova Scotia.

Indeed, we heard an industry representative speak on Maritime Noon, the CBC Radio One program, a couple of times and his benign comments about industry prudently taking time to get this right do not reassure us whatsoever.

We have read about the experience of fracking in the U.S., and the process has serious, irreversible consequences. In the experience of one group, Stop Arkansas Fracking (stoparkansasfracking.org), 'The whole process for just one well requires thousands of truck trips'. But road damage and noise pollution are lesser problems: seismic mapping requires 'large machines to pound the ground', air gun arrays underwater, both a major disturbance to wildlife. 'Two to ten million gallons of water' for each well is 'taken from local bodies of water' and 'mixed with sand and toxic chemicals' which 'will remain potent for thousands of years'. Some companies, we gather, have promised to supply bottled water to those whose own wells have been contaminated, no comfort whatsoever to any homeowner, especially a farmer with livestock.

Because of such consequences, we argue for a moratorium on fracking in Nova Scotia and at the very least a full public review.

With respect,

Nancy Bird & Bob Unger
From: Alison Petten
To: <frac-review@gov.ns.ca>
Date: 6/5/2011 10:39 PM
Subject: Submission to Review of Hydraulic Fracturing for Shale gas
Attachments: EHANS fracking scope submission June 5, 2011.pdf

Please find pdf attachment to be submitted to Review of Hydraulic Fracturing for Shale Gas on behalf of the Environmental Health Association of Nova Scotia.

Thank you.
Alison Petten
VP-EHANS
Submission to Review of Hydraulic Fracturing for Shale Gas
June 5, 2011

I am writing on behalf of the Environmental Health Association of Nova Scotia (EHANS). EHANS is a province wide organization that focuses on environmental impacts on human health and promoting actions and policies to prevent environmentally related illnesses. For 25 years, EHANS has focused on four fundamental necessities for health -- clean air, clean food, clean water and less toxic products. Fracking threatens two of these essentials: clean air and clean water.

EHANS believes fracking and shale gas development present risks to health that are serious, widespread and long lasting. We believe that fracking, however it is conducted, poses serious risks to public health and the environment, and that these risks at this time outweigh any possible benefit. Clean air and clean water are our most basic resources. There are no alternative sources of clean air or clean water.

The government's proposed review of fracking does not even mention health impacts. This is a major omission. There are serious, immediate and long-term health risks from fracking and shale gas development. Some of these risks include:

- Smog measured at higher levels than in major urban centers in fracking areas, and benzene and other carcinogenic chemicals measured at levels far beyond safe levels in air in fracking areas.
- Use of volatile carcinogenic compounds in fracking fluids which can impact health through air pollution as well as pollution of drinking water.
- Volatile organic compounds and other toxic chemicals released from condensate tanks and wastewater holding ponds.
- Volatile organic compounds and other toxic chemicals released in the drilling, mining, flare-off, transfer and transport stages of shale gas drilling and fracking.
- Pollutants which are known to cause respiratory damage, and evidence of above normal respiratory problems in areas where fracking has taken

P.O. Box 31323, Halifax, Nova Scotia B3K 5Y5
www.environmentalhealth.ca
www.lesstoxicguide.ca
Risk of ingestion of contaminated water before it reaches levels where problems are evident. Other fracking chemicals are known carcinogens and endocrine disrupters, and may be present in drinking water and other household water before they become noticeable by taste or smell. Although it is believed that methane in drinking water is not a health risk, this has never been studied.

- Exposure to contaminants in wastewater in holding ponds, including fracking fluid chemicals as well as heavy metals, radioactive materials and other materials which are released by fracking the shale layer, and return to the surface.
- Contaminated water released into the environment after "treatment," with levels of toxins accumulating with each release.
- Radioactive material is often freed from the shale via fracking. There is already evidence of some potential routes of exposure including via wastewater holding ponds, via release into waterways after wastewater goes through "treatment" facilities. It is also possible that radioactive material may seep into wells undetected, or into homes and other buildings as radon. In Nova Scotia, where uranium is present in many areas of the province, the risk must be considered.

Now that it has been proven that methane leaks from shale layer into wells, it is logical to assume that fracking chemicals and other toxins released by fracking will also migrate and eventually enter aquifers, even if this does not take place for a number of years. Until there is evidence that gas companies can stop all leaks of methane into wells, we must assume that wells are also at risk of contamination from fracking fluids.

- Sour gas release is a health risk to workers and communities.
- Fracking fluid spills, whether from ponds or trucks, create risks from both soluble chemicals which can contaminate soil and water, and volatile chemicals.
- Risk of chemical sensitization from multiple toxic chemical exposures.

Any evaluation of health risks from fracking must consider that:

- Safe levels of exposure are normally determined by levels determined safe for healthy adult males exposed 8 hours a day, while citizens who will be exposed to fracking and shale gas pollutants will be exposed 24 hours a day, 7 days a week, and will include vulnerable populations including children, pregnant women, and other vulnerable groups.
- Many of the chemicals in use have not been tested for safety in humans, especially for long-term effects such as endocrine disruption.

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1 Jackson et al, Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction, 2011, Center on Global Change, Duke University, Durham, NC.
2 Ben Parfitt, Vancouver Sun, March 9, 2011
In most places where fracking has been conducted, the chemical composition of fracking fluids has remained secret, which means there has been little ability to study connections between fracking and health impacts in surrounding communities.

- Exposure to a cocktail of chemicals in areas where shale gas development and fracking is taking place is involuntary and unavoidable. Outdoor air goes inside houses, so exposure to VOCs in interior air will be unavoidable. There is not even warning when activities which may release high levels of chemicals are to take place.

- Some health impacts may be immediately evident, others may not occur for years or decades or until the next generation.

- Now that methane has been proven to seep from the shale layer into wells up to a mile away a drill site, it is reasonable to assume that fracking chemicals may do so also, although because they are not gases this may take years before it is seen. How can monitoring for this risk conceivably be done? There would need to be monthly tests for hundreds or thousands of homes for many decades.

- There is risk of exposure in drinking water before water problems are detectable. Low level exposures can have significant impacts, especially with endocrine disrupting chemicals, and especially with vulnerable populations and at particular windows of development where effects have greater impact.

**Air pollution and related health impacts**

The proposed review ignores the issue of air pollution, a known problem with shale gas development and one of the major ways in which health can be compromised. It would be less than honest to argue that air pollution is not related to fracking, when air pollution is associated with many stages of the operation, including volatile chemical emissions from condensate tanks and holding ponds, trucks transporting waste water, and smog resulting from increased ozone levels.

Evidence is mounting documenting serious risks of health impacts from fracking and from the process of shale gas development. Some of these health impacts are already evident in areas where fracking is taking place, while others may not be evident for decades or until the next generation, including cancers, and multiple effects of endocrine disruption including reproductive effects.

One of the results of industrialization of rural areas from fracking and shale gas development has been shown to be air pollution above the levels of major urban centers, and above established safe levels.

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3 Jackson et al
After residents of Dish, Texas began reporting a range of symptoms including nosebleeds, headaches, and dizziness, the company "investigated" and reported that everything was normal, that there were no emissions detectable to the human nose. The town spent 15% of its budget to hire Wolf Eagle Environmental, an independent laboratory, to conduct air quality tests. Test results found high levels of 15 chemicals, including benzene, xylene, naphthalene and carbon disulfide at five of seven test sites. In some cases the levels were 10 times the recommended level for short-term exposure, and some levels were high enough to be an immediate danger, according to the study. 4

"Laboratory results confirmed the presence of multiple Recognized and Suspected Human Carcinogens in fugitive air emissions present on several locations tested in the Town of DISH.

The compounds identified are commonly known to emanate from industrial processes directly related to the natural gas industrial processes of exploration, drilling, flaring and compression. The laboratory results confirmed levels in excess of TCEQ’s Short Term and Long Term ESLs. In addition, several locations confirmed exceedences in a chemical identified by TCEQ with the capability for ‘disaster potential’. (See Section - Laboratory Results)

The Town of DISH has virtually no heavy industry other than the compression stations. There is no other facility with the capability to produce the volume of air toxins present within miles of the Town. Fugitive emission sources of hazardous air pollutants emanating from the oil and gas sector include emissions from pumps, compressors, engine exhaust and oil/condensate tanks, pressure relief devices, sampling connections systems, well drilling (hydraulic fracturing), engines, well completions, gas processing and transmissions as well a mobile vehicle transportation emissions. Along with hazardous air pollutants (HAPs) and known carcinogenic compounds, air toxic compounds that contribute to smog formation were identified and are a known emission of gas industrial exploration, compression, processing and distribution.

Many chemicals identified in laboratory results at several locations tested were found to exceed TCEQ’s ESL’s. These chemicals include Benzene, Dimethyl disulfide, Methyl ethyl disulfide, Ethyl-methylthethyl disulfide, Trimethyl benzene, Diethyl benzene, Methyl-methylthethyl benzene, Tetramethyl benzene, Naphthalene, 1,2,4-

Trimethyl benzene, m&p Xylenes, Carbonyl sulfide, Carbon disulfide, Methyl pyridine, and Diethyl pyridine. \(^5\)

Later testing by the Texas Committee on Environmental Quality confirmed these results.

On March 9, 2011, the Associated Press (AP) reported that in rural Wyoming, home to shale gas development, “residents are complaining of watery eyes, shortness of breath and bloody noses.” The cause: ozone levels higher than the worst days in Los Angeles all last year. AP reported that the region’s ozone levels the previous week had reached 124 parts per billion, two-thirds higher than the EPA’s maximum healthy limit of 75 ppb.

These levels were reached in spite of the fact that gas industry officials reported that they had been trying to curb smog, and claimed that there were fewer emissions contributing to smog than in 2008, according to AP. This means the smog problem, with related health impacts, had been recognized, and continuing, for 4 years. \(^6\)

Air pollution from fracking operations is not only localized. Smog pollution from drilling can travel up to 200 miles from the gas production area, causing widespread damage to human and environmental health. \(^7\)

We are not only all downstream, but downwind, from the health risks of natural gas drilling. Major portions of the province would likely suffer deteriorated air quality from shale gas development.

**Water contamination and health**

Water is clearly a critical issue and the scope outline includes water issues. But the omission of any mention of health risks does not encourage confidence in this review. In the US, critical information about the chemical composition of fracking fluids has remained secret. *Natural Gas Operations from a Public Health Perspective* \(^8\), written by Dr. Theo Colborn, an international expert on endocrine disruption, studies the risks of chemicals used in drilling and fracking and their

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\(^6\) http://content.time.com/time/specials/packages/article/0,28804,2017700,00.html.

\(^7\) http://www.earthjustice.org/upload/Orange_County_smog

potential health impacts. Colborn reports that forty three per cent of products used in natural gas operations disclosed less than 1% of their ingredients. (Appendix A) Of the ingredients disclosed, 126 volatile chemicals and 296 soluble chemicals identified have multiple health impacts, including impacts on respiratory, brain and nervous system, immune, and kidney function, as well as endocrine disruption, cancers and mutagenic effects. (Appendix B.) Colborn also documents the possible health effects of 49 chemicals in six New Mexico drilling evaporation pits. (Appendix C)

Endocrine disrupting chemicals can have serious impacts even in minute quantities. "These chemicals at low concentrations can be dangerous. Believe me, it is the part per billion and the part per trillion of chemicals that can undermine your health and especially if they get into the drinking water of a woman who is pregnant or in the drinking water of our children," states Colborn, in an interview with BBC Newnight. 9

This information is likely just the tip of the iceberg, as evidenced by the number of chemicals in fracking fluids which remained unidentified at the time this paper was written.

There is also risk of water contamination from spills from holding ponds and trucks, which risk increases with extreme weather conditions, from contaminants contained in post-treatment water, and from other sources, given that the fracking process involves the purposeful contamination of millions of gallons of water.

Regulation cannot provide sufficient protection. Too much is still unknown. EHANS believes that the review outlined by the Departments of Natural Resources and Environment is completely insufficient. We do not see this as a review of fracking, but rather a limited review of regulations. The scope of this review implies that the Government has already decided that fracking is an acceptable practice, despite the fact that evidence points to huge information gaps and huge risks.

The "unconventional gas" industry has been extremely effective in gaining exemptions from regulation, most notably from sections of the Clean Air Act and Clean Water Act in the US. Why would the industry lobby so hard for years to gain exemptions to these basic protections, unless they were aware that their practices had a good chance of contaminating air and water beyond acceptable levels?

In a situation where so much is at stake, too much is still unknown. “Best industry practices” cannot be assumed to be safe industry practices. No independent

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studies have shown the full risks and potential impacts of many of the practices used in fracking. There may be industry practices which appear less risky than others, but no research evidence shows whether even the best practices are good enough to prevent serious and irreversible harm.

Take the example of what to do with toxic, radioactive wastewater. According to Jackson et al in Research and Policy Recommendations for Hydraulic Fracturing and Shale-Gas Extraction, 2011, "there is, to our knowledge, no comprehensive evaluation of the long-term impacts of wastewater disposal."  

"Hydraulic fracturing produces saline and toxic waste waters (including some with potentially high naturally occurring radioactivity) that flow out of the gas wells. Currently, wastewaters originating from hydraulic fracturing and gas production are disposed of by
(1) transport to wastewater and/or brine treatment centers, where they are treated and released to local surface water;
(2) injection into deep geological formations that are presumably disconnected from the overlying shallow drinking water aquifers;
(3) recycled using a variety of treatment technologies and re-injected as fracturing fluid; and
(4) spread on local roads for dust suppression."  

Whichever of these four methods industry claims to be "industry best practice," the long-term impact has never been evaluated for safety. That is a BIG information gap, where millions of gallons of contaminated, radioactive water is concerned.

This is only one example of the serious lack of information about practices which may contaminate water, an invaluable resource, and compromise health and the environment for many generations.

Many of the effects of fracking and related processes cannot be effectively regulated. Accepted methods of regulation are, in many cases, inappropriate to the situation. How can the cumulative impact of multiple fractures be regulated? What about the cumulative impact of water use, water contamination, air pollution from hundreds of wells and their associated condensate tanks, holding tanks, truck traffic and other operations on a small geographic area. Regulating operations one by one will not provide sufficient protection. For example, Triangle's production lease application of 2009, approved by the province, foresees drilling up to 100 wells in the first two years, with an additional 80 wells per year for 7 years, over 650 wells, plus associated pipelines, separators, etc.

10 Jackson et al
11 Jackson et al
storage tanks, processing plants, compressors and truck traffic. Each of those wells could be fracked up to 17 times. The cumulative impact in a small province like Nova Scotia would be significant, as it has been even in larger areas such as Texas, Wyoming and other states.

**Regulations are only as effective as their enforcement**

Even if regulations could be effective in reducing harm, they will only be as effective as their enforcement.

On December 3, 2010, BBC's Newsnight interviewed Pennsylvania Department of Environmental Protection (DEP) Secretary, John Hagnar. "BBC: John Hagnar is locked in a bitter legal battle with Cabot. He says he has strong scientific evidence that links the escaped gas to their wells."

Hagnar: The results ruled out that this was biogenic gas, or pre-existing gas, and in fact the gas was tied specifically to wells that Cabot had, so we have sophisticated testing, it's the equivalent to fingerprinting gas, and we've got Cabot's fingerprints all over the gas.

"BBC: He showed us consent agreements signed by Cabot setting out problems with the cement casings in some of their wells, and accepting responsibility for methane pollution of private water. Now the company says they signed only under duress.

Hagnar: It is an amazing claim by Cabot, and it underlines one more time what kind of company we are dealing with, that they would make this amazing claim. ...They have an armada of attorneys which frankly they have let loose on the state like a plague of locusts..."

To be protective, enforcement of regulations also has to be timely. In Wyoming, identified problems with smog have not been corrected for years, as mentioned above. Sharon Wilson of the Texas Oil and Gas Accountability Project presented information to EPA hearings that, "In 2003, atmospheric researchers from the University of California were surprised to find extraordinarily high hydrocarbon levels in North Texas at concentration s higher than what they expected for the entire country." Six years later, Wilson reports, "A 2009 study by SMU found..."
that emissions from Barnett Shale natural gas extraction were as much as vehicular emissions in the entire Dallas-Fort Worth region.¹⁵

Much larger and more powerful jurisdictions than Nova Scotia, including the US EPA, have had little success reiniging in the deep-pocketed oil and gas companies, backed by a powerful industry lobby. How can we imagine that Nova Scotia will do better?

Recently, EHANS was part of a coalition on another environmental health issue. The coalition was told by a representative of the Department of Environment that a particular clause could not be included in regulations because the province did not have the capacity to enforce it. Enforcing this regulation would have been child’s play, compared to enforcing regulations relating to protection of water, air, and soil from complex fracking related operations.

Given all these factors, we do not believe that regulation and enforcement can provide reliable protection from the risks posed by fracking.

Not just another mineral extraction
Shale gas development and fracking cannot be treated as just another type of mineral extraction, to be regulated and remediated like a coal mine. The risks are much higher, more widespread, and more subtle. Contaminating water supplies is not remediable. Once rural areas have been industrialized, they cannot be restored.

Site restoration is one of the topics listed in the scope document. Assuming that site restoration will be an acceptable way of dealing with problems is not logical. How can there be restoration once toxins have escaped into the environment, to go who knows where, carried underground in waterways, or into air. At the N-14-A well, near Noel Lake in the Kennetcook area, 85% of drilling fluids were never recovered from a frac. Apparently, they disappeared underground, and no one knows why or where. How can that site be restored, except on the surface? This seems to happen more often than one might expect in fracking operations, because what is underground is often unpredictable, according to rock fracture expert Dr. Tony Ingraffea.

Take a precautionary approach
Independent research is revealing that in spite of the spread of fracking across the US, there has been little or no study of the impacts of fracking and shale gas development in the short term and even less information about long term cumulative risks.

¹⁵ http://www.youtube.com/watch?v=8C3HJINUSE4ik , Appendix D
Fracking is an issue where an ounce of prevention is worth a ton of cure. The precautionary principle is enshrined in the Nova Scotia Environment Act for a good reason. It must be the foundation for how the government evaluates any development of onshore gas, especially involving fracking.

Nova Scotia needs to take a precautionary approach. There is too much at stake to proceed at this time. We believe that there is sufficient evidence now to ban fracking outright. At a minimum, the only other responsible step would be to place an immediate moratorium on fracking for a minimum of 5 years, with a commitment that the moratorium would not be lifted unless there is sufficient independent research to prove it is safe.

EHANS appreciates the opportunity to make this submission. We hope that the review team heeds public opinion, and looks at fracking with the clear sightedness required to protect our water, our health, and our environment.

Sincerely,

Alison Petten
Vice-President, EHANS
apelten@ns.sympatico.ca
902-453-2737
Box 31323, Halifax, Nova Scotia B3K5Y5
Appendix A
Natural Gas Operations from a Public Health Perspective
Theo Colborn, Carol Kwiatkowski, Kim Schultz, and Mary Bachran
TEDX, The Endocrine Disruption Exchange, Paonia, CO, USA

Figure 2. Profile of possible health effects of chemicals with CAS numbers used in natural gas operations.
Appendix B
Natural Gas Operations from a Public Health Perspective
Theo Colborn, Carol Kwiatkowski, Kim Schultz, and Mary Bachran
TEDX, The Endocrine Disruption Exchange, Paonia, CO, USA

Figure 3: Profile of possible health effects of solute and volatile chemicals with CAS numbers used in natural gas operations.

- Solute (n=296)
- Volatile (n=176)
Appendix C
Natural Gas Operations from a Public Health Perspective
Theo Colborn, Carol Kwiatkowski, Kim Schultz, and Mary Bachran
TEDX, The Endocrine Disruption Exchange, Paonia, CO, USA

Figure 5: Profile of possible health effects of chemicals with CAS numbers found in six New Mexico drilling evaporation pits.
Appendix D: Transcript of YouTube video, Sharon Wilson testimony to EPA Public Hearing, March 2010

Hello. My name is Sharon Wilson. This afternoon, I'm making a joint statement on behalf of the Texas Oil and Gas Accountability project and Fort Worth Citizens Against Neighborhood Drilling Operations. Texas Oil and Gas Accountability Project has put forth Drill-Right Texas, the best oil and gas development practices for Texas. Texas OGAP considers the new ozone standard one of several essential tools needed in a regional plan to clean our air. Tougher standards will prevent natural gas extraction from continuing to foul our air and harm our health. A 2009 study by SMU found that emissions from Barnett Shale natural gas extraction were as much as vehicular emissions in the entire Dallas-Fort Worth region. This study was based on textbook examples but the reality could be a much worse picture. Researchers at Rice University followed the SMU study to see whether Barnett Shale gas production could be affecting our air quality. Using both condensate production data and ambient air data from Denton County, those researchers found a strong correlation between natural gas production and what was showing up in the air. This really isn't news. In 2003, atmospheric researchers from the University of California were surprised to find extraordinarily high hydrocarbon levels in North Texas at concentrations higher than what they expected for the entire country. We know that fugitive emissions occur at every stage of production from flow lines and gathering lines, from vents and condensate tanks, dehydrators and compressors, metering stations and valves. A single compression facility can emit six times the volatile organic compounds as a cement plant. Natural gas is methane and methane is the most powerful greenhouse gas—at least 20 times more potent than carbon dioxide. And methane is a surrogate gas that carries a host of bad guys—carcinogens and neurotoxins with it. From cradle to grave, the extraction process is filthy and brings with it its own intense source of on-road and off-road diesel and NOx emissions. In Texas, the permit by rule process is abused allowing all these emissions to go unchecked. 11 compression stations and 4 metering stations operate side-by-side in Dish, Texas, each considered a separate source. Residents suffer a host of ailments including irritated skin, eyes, nose, throat and lungs, headaches, dizziness, nausea, vomiting, skin rashes, weakness and irregular heartbeats. A whopping 61% of those health effects were directly attributed to the emissions. And throughout the Shale, children suffer stunning asthma rates — 25% of 8 and 9 year-olds have asthma – compared to 7 percent of children statewide. TCEQ knows our air is bad. When asked about the Texas Commission on Environmental Quality's testing in the Barnett Shale, Shannon Ethridge, TCEQ Toxicologist said they had seen some of
the highest benzene concentrations we have monitored in the state. She compared the DFW area emissions to those found in the highly industrialized Houston Ship Channel area. Michael Honeycutt, chief of TCEQ's toxicology division, told Channel 8 News that air samplings around some gas wells revealed high levels of cancerous toxins. "That would be equivalent to opening a can of gasoline and holding it up under your nose."

He added that a year or more of exposure to benzene can lead to health problems including anemia, immune disorders and leukemia. We are way past that one year mark. The technology is there to reduce the emissions and industry can afford to implement it but they won't unless it's mandated. We are depending on you to protect public health by mandating and enforcing vigorous new regional ozone standards. Thank you.

http://www.youtu.be/watch?v=RChNNUJF4jk
I am writing in regards to the proposal drilling project in the Lake Ainslie Area.

My real concern is about the extracting system known as "fracturing".

From the information I have received, it has been proven that this type of operation will destroy the water table supplying the residents for many kilometers around the Lake Ainslie area and beyond including the Margaree River system, which will in turn, destroy the gaspereau fishing industry, plus the salmon and trout sports fishing

I would be an absolute sin to destroy the legacy of Lake Ainslie which has been a "Jewel" in the beautiful landscape of Cape Breton since our ancestors came here over two hundred years ago.

I am "pleading" with you to cancel any and all drilling rights permanently before any damage can be done.

Yours truly,
Tax payer and resident of Lake Ainslie,
Vincent Walker.
From: "mary lou harley"
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 2:42 AM
Subject: submission on Scope of Hydraulic Fracturing Study
Attachments: Hydraulic Fracturing Study on Scope.doc

Please find attached my submission on the draft scope of the review of hydraulic fracturing. Thank you for the opportunity to participate.

Mary Lou Harley, PhD
Submission by Mary Lou Harley on the Draft Scope of the Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment

I identify topics for examination in addition to the potential issues presently in the Draft Scope for the Review of hydraulic fracturing in shale gas operations in Nova Scotia, given on your website as:

- effects on groundwater;
- use and effects on surface water;
- impacts on land, such as potential soil contamination;
- waste management, including surface ponds of produced waters;
- identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids;
- site restoration; and
- financial security / insurance that operators are required to provide prior to conducting activity in the province.

An adequate Review also must examine:

- identification and fate of chemicals released from the rock (including but not limited to hydrocarbons, arsenic, radon and other radioactive chemicals)
- impacts on air quality
- the health risks associated with the chemicals used in and potentially released by fracking
- potential health impacts as a result of the hydraulic fracturing process impacts and the waste management impacts on air, aquifers, surface water, and land
- impacts of seismic activity on the subsurface, including commingling of multiple zones and fracturing into aquifers
- impacts of seismic activity on properties
- the failure of present Nova Scotia regulations to ensure that "nothing put down the well or brought up the well can escape anywhere it is not intended," ¹
- the potential environmental consequences of unrecovered fracking fluids
- impacts on communities, quality of life and the rural landscape
- the potential of cumulative impacts
- concerns raised in many areas including Quebec, France, New York state, Pennsylvania, Colorado, Wyoming and Texas by landowners, scientists, and engineers; and the outcome of the US Environmental Protection Agency investigation into the risks of the entire deep drilling process, including hydraulic fracturing.

¹ The quote is from NS Environment Shale Gas Hydraulic Fracturing - Fact Sheet

In early 2010, NS regulations proved to be inadequate when Elmworth Energy used the hydraulic fracture method on a well in Nova Scotia and recovered only 15% of flowback waters; 85% of the fracking chemicals plus chemicals released from the rock escaped and their transport within the fractured rock and aquifers is unknown.

In New Brunswick, Apache Corp. had a similar experience in Elgin, where injected fracking chemicals could not be recovered as expected, and the migration through subsurface fractured rock and water of these undisclosed applied chemicals and the additional chemicals released from the rock is unknown.
From: Heather Mayhew
To: <frac-review@gov.ns.ca>
CC: <groundwater@ecologyaction.ca>
Date: 6/6/2011 8:36 AM
Subject: Fracking
Attachments: letter_NS_gov_re_frackingc[1].docx

to frac-review@gov.ns.ca, or

June 4, 2011

Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8
Dear Team of Senior Technical and Policy Staff,
My name is Heather Mayhew, and I wish to express my concerns and comments about hydraulic fracturing, in response to the request by the government of Nova Scotia for input from the public.
I live in Antigonish, a rural community dependent on the quality of groundwater for its drinking water. Our community is in a region where healthy, unpolluted streams drain into an estuary that is a thriving ecosystem, providing important habitat for fish such as eels, smelt, sea trout, and Atlantic salmon, and wildlife such as black ducks, great blue herons and muskrats. Our transportation routes tend to follow the waterways, and thus have the capacity to impact these systems when they are either altered, or when accidents occur. In addition, the economy of this Northern Nova Scotia community is tied to maintaining the beauty and integrity of the natural environment. Many of our livelihoods are based on tourism, recreation, fishing, forestry and farming. Development in the natural gas industry, that includes hydraulic fracturing, has the potential to cause great harm to the community and its environment.
I want the government to review the process of hydraulic fracturing for shale gas very seriously, and consider banning it completely. The following are some areas that I find of particular concern.
1. Effects on groundwater: Even though regulations may be in place regarding drilling practices, it is known that accidents involving the cement casings do happen, and contamination of groundwater by the toxic fluids used is a real possibility. It may occur at any level of the well, even though the shale may be much deeper than groundwater.
2. Effects on surface water: Spills, during fluid transport on highways, and at well site, and storage sites are very real dangers from the hydraulic fracturing fluids. The array of toxic chemicals as yet unidentified to the public, would be a nightmare to clean up.
3. Impacts on land, such as potential soil contamination: Spills of fluids, and during transport of natural gas may contaminate soil. How will such soils be cleaned? Who is responsible? How will land owners be compensated?
4. Waste management, including surface ponds of produced waters: Hydraulic fracturing fluids come back up to the surface and the toxic 'waste fluids' must be stored or disposed of. The potential dangers of this aspect of drilling must be addressed.
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids: All chemicals need to be identified, plans for spills transparent, and risks to health and environment explained to public. It is understood that the companies do not release the ingredients of their fracturing fluids.
6. Site restoration: What will be the scale, and who is responsible?
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province: There must be public transparency at all levels of development, and compensation must be fair, if this procedure is allowed to go on.
A review is currently being done in the US by the Environmental Protection Agency. A large number of wells have been drilled and natural gas extracted using the hydraulic fracturing process. I recommend that we not proceed with such development until at least, the EPA’s review has been made public and evaluated.
Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just requesting public comments. I believe that the public consultation process should be approved by the public and include public forums.
Thank you for the opportunity to express my concerns. I urge you to act responsibly when considering the effects of hydraulic fracturing in Nova Scotia.
Heather Mayhew
Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8

Dear Team of Senior Technical and Policy Staff,

My name is Heather Mayhew, and I wish to express my concerns and comments about hydraulic fracturing, in response to the request by the government of Nova Scotia for input from the public.

I live in Antigonish, a rural community dependent on the quality of groundwater for its drinking water. Our community is in a region where healthy, unpolluted streams drain into an estuary that is a thriving ecosystem, providing important habitat for fish such as eels, smelt, seatrout, and Atlantic salmon, and wildlife such as black ducks, great blue herons and muskrats. Our transportation routes tend to follow the waterways, and thus have the capacity to impact these systems when they are either altered, or when accidents occur. In addition, the economy of this Northern Nova Scotia community is tied to maintaining the beauty and integrity of the natural environment. Many of our livelihoods are based on tourism, recreation, fishing, forestry and farming. Development in the natural gas industry, that includes hydraulic fracturing, has the potential to cause great harm to the community and its environment.

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5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids: All chemicals need to be identified, plans for spills transparent, and risks to health and environment explained to public. It is understood that the companies do not release the ingredients of their fracturing fluids.

6. Site restoration: What will be the scale, and who is responsible?

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province: There must be public transparency at all levels of development, and compensation must be fair, if this procedure is allowed to go on.

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Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just requesting public comments. I believe that the public consultation process should be approved by the public and include public forums.

Thank you for the opportunity to express my concerns. I urge you to act responsibly when considering the effects of hydraulic fracturing in Nova Scotia.

Heather Mayhew
From: <frac-review@gov.ns.ca>
To: 6/6/2011 8:58 AM
Subject: Submission for slick water review

Dear Team of Senior Technical and Policy Staff,

My name is Robert Parkins
I am from
Where the "frac" did the water go ??
12,000 cubic meters of water to frac a well
3,170,064 equals gallons of water to frac a well
11,982,842 equals liters of water to frac a well
500,000 wells frac'd in B.C. Alberta, and Saskatchewan - with incidents reported
5,991,420,960,000 equals liters of water destroyed by B.C. Alberta, and Saskatchewan (to date of information posted on energy web site) to frac,
This does not include water made undrinkable due to slick water frac'ing
600,000 gallons of water in an Olympic sized swimming pool
3,240,000,000 gallons of water flows over Niagara Falls per day
2,641,720 number of Olympic swimming pools that could have been filled by destroyed water
489 number of days for the water destroyed by slick water horizontal drilling to flow over Niagara Falls

I not only want slick water horizontal drilling outright banned I also want the Ainslie Block Lease not extended for PetroWorth is in total violation of it's terms, the Energy Department has bent over backwards for this company and has done everything but put the drill into the ground for them. The lease needs to be returned to the province and never released for oil or gas exploration for the area is too important to the residents of Nova Scotia, too important to the flora and fauna of the area, too important to the future of our grandchildren's children.
The reasons for the exploration given by the energy department and the views of some of the employees are out of sync with the realities of the problems of the world. Destroying one non renewable resource which life will not exist without to extract another no renewable resource, that in the cradle to grave life of the resource is far more polluting than what we are presently using, that we also can live without is simply Orwellian. The only reason this is happening is profit motivation. It will do nothing to solve any energy or environmental crisis created by the very corporations now lobbying to use this dangerous and toxic method.
Ask yourself, ultimately who is being effected by this, the corporations or the citizens that you took a vow to serve to the best of your ability. What is more important to you, corporate profits or the children’s future. One of the tag lines given by the oil companies and the energy department is that the toxic dangerous chemicals will remain underground, if that is so then why is there oil seeps on the surface, something is under pressure down under there, I am not saying that it will come up tomorrow but it will come up and then what, we will be dead and gone so don't worry about it? There is also evidence, science based, of chemicals and gas being released into streams, killing everything. Is this the Russian roulette you want to play with Lake Ainslie or any body of water? Is that what this is worth to you? A few dead fish? Maybe some roads that will have to be repaired in one year instead of five years? Maybe some farmland that can no longer be used? Or some dead trees and grass as the chemicals are gassed off and kill
everything down wind? Or just some inconvenience to some people in rural Cape Breton, with constant noise, extreme truck traffic, air pollution? Or some dead pets? Heck they shouldn’t be near the road any ways eh? Industry best practices: Cleaning up spills as soon as they are noticed. These products are created to flow quickly and with little resistance, so how far can they flow into the ground before they are noticed. How much do you dig up to get it all, how long before they are noticed?

Where is the water coming from for this? Surface water that isn’t potable maybe? From a stream that has no fish in it? Rain water? From my days in school I learned there was a water system and all these eventually made their way through it through sinking into the aquifers. Mother natures natural cleansing of water. You take those trillions of gallons of water, stick them a mile underground, I pray to God, they stay since they are so toxic it basically kills on contact. Now there is a massive short fall in the water system, water tables drop, lakes and streams drop. A 2002 study done by Canadian Geographic showed that massive pumping from the aquifers was one of the leading causes why the great lakes were at all time low.

Stop thinking about today or tomorrow, think about 20 years from now, your actions will have a major impact on this world.

Stop looking for the one big fix, upgrade the aging hydro systems already in place, spend the resource catering to the oil and gas industry and use it to help finance alternative energy companies, people looking at smaller units that can be utilized by individuals, businesses. Different configurations of wind mills, solar, hydrogen, inline turbines driven by the town water main.

More emphasis on conservation, without the penalties of the NS Power saying we are not making enough profit so we need to raise the rate. This is a great time to start to break the hold we all have allowed the oil and gas corporations to have on us.

Jobs. We don’t need more drillers, seismic testers, or oil rig workers. We need more electricians, more plumbers, more carpenters, more auto mechanics, more doctors. Try to find one of those in Cape Breton, then try to get anything done quickly. The ones we do have are so busy that it takes over a year to get any major electrical work done.

This isn’t going to happen and the sooner the departments realize it then the greater the chance of gaining some respect from the voting public.

Stop this madness. Retrieve the lease. Protect Lake Ainslie

With all due respect,

Robert Parkins
June 6, 2011

Dear Team Members, Senior Technical and Policy Staff,

I am a resident of Ardoise, Nova Scotia—a community named by the Acadian settlers using the French word for "slate" (more accurately shale) because they noted the nature and importance of the geological formation on which they founded their small farms. Our own property is on one of these old farms and its land provides much of our own food as well as a small surplus which we pass on to friends and neighbours. Our water supply which is (so far) reasonably reliable and biologically safe supplies the needs of ourselves, our livestock and our garden crops. Like many of our neighbours, we also obtain a more palatable drinking water from a nearby spring piped from a hillside in this same shale deposit.

Since becoming aware of the possibility that new permits for onshore natural gas exploration may be granted I have become very concerned that the water that sustains this community may be placed at risk from hydrofracking procedures.

My initial concerns have been intensified by reading further on the subject and have led me to submit these comments to the review process. I am, however, seriously troubled by the way in which the review process has been structured. Decision-making based only on written comments from the public amounts to an in camera process without transparency or accountability. Even more worrying is the April 5, 2011 documentation provided to accompany the call for comments. This is essentially formatted to ask how hydrofracking should be conducted not if it should be done at all. Even a superficial content analysis of the "facts" offered for consideration suggests that the goal is to "calm public fears" rather than to invite thorough analysis. I would urge that the collation of written public comment be followed by public hearings in order to make the process more transparent and to promote public education on the issue.

My principal concerns relate to the potential for chemical and/or structural hydrologic destruction.

It is, quite simply, unknown what effects may follow profound
disruption of deep geological structures. An industry spokesman explains in a recent Scientific American article that fracking "cracks [the formation] just like a windshield." There is now even a concern in the UK that hydrofracking may have triggered small earthquakes in previously seismically stable areas. The effects of structural disruption on the scale involved in fracking is, by its very nature, unpredictable and entails unknowable hydrological (and possibly even seismic) consequences.

Industry spokespeople like to characterize public opposition to hydrofracking as the product of technological ignorance and a fearfulness of the new. However, a huge body of impeccable scientific evidence indicating serious ecological consequences from hydrofracking is appearing in very conservative institutional and media sources. One of the most notable among these is the "Briefing on Hydrofracking" by the EPA in the US obtained by the New York Times in 2010 and made available in full on its website. A standard ingredient in the fracking process is diesel which contains the carcinogenic so-called BTEX chemicals -- benzene, toluene, ethylbenzene and xylenes. However, the industry admits to using other petroleum distillates that contain 93 times the amount of benzene contained in diesel fuel. Since benzene, a proven carcinogen, is considered unsafe in drinking water at levels above five parts per billion, the equivalent of a few drops in a swimming pool, it is impossible to be phlegmatic about the potential risks to health posed by this process. All of this would, on its own, be more than sufficient cause for concern. However, the industry maintains corporate secrecy about the identity of many chemicals in use. Furthermore, according the EPA, companies were themselves unable to identify what chemicals were incorporated in many of the products they use. More recently, the US House of Representatives Committee on Energy and Commerce identified 650 known human carcinogens in products used in hydrofracking.

There are numerous other ecological issues as well other concerns related to economic impacts in urgent need of consideration on this matter which, in view of the urgent deadline, I am unable to take time to delineate here. I do however, hope that the government will take the opportunity for a full public discussion of this subject in the form of public hearings.

I also hope that, as a team of advisers with technical expertise, you will consider the full implications of the hydrofracking process, not merely the short-term economic goals of a few corporations and their shareholders.

Yours truly,

Gillian Thomas
June 6, 2011

Dear Team Members, Senior Technical and Policy Staff,

I am a resident of Ardoise, Nova Scotia—a community named by the Acadian settlers using the French word for "slate" (more accurately shale) because they noted the nature and importance of the geological formation on which they founded their small farms. Our own property is on one of these old farms and its land provides much of our own food as well as a small surplus which we pass on to friends and neighbours. Our water supply which is (so far) reasonably reliable and biologically safe supplies the needs of ourselves, our livestock and our garden crops. Like many of our neighbours, we also obtain a more palatable drinking water from a nearby spring piped from a hillside in this same shale deposit.

Since becoming aware of the possibility that new permits for onshore natural gas exploration may be granted I have become very concerned that the water that sustains this community may be placed at risk from hydrofracking procedures.

My initial concerns have been intensified by reading further on the subject and have led me to submit these comments to the review process. I am, however, seriously troubled by the way in which the review process has been structured. Decision-making based only on written comments from the public amounts to an in camera process without transparency or accountability. Even more worrying is the April 5, 2011 documentation provided to accompany the call for comments. This is essentially formatted to ask how hydrofracking should be conducted not if it should be done at all. Even a superficial content analysis of the "facts" offered for consideration suggests that
the goal is to "calm public fears" rather than to invite thorough analysis. I would urge that the collation of written public comment be followed by public hearings in order to make the process more transparent and to promote public education on the issue.

My principal concerns relate to the potential for chemical and/or structural hydrologic destruction.

It is, quite simply, unknown what effects may follow profound disruption of deep geological structures. An industry spokesman explains in a recent *Scientific American* article that fracking "cracks [the formation] just like a windshield." There is now even a concern in the UK that hydrofracking may have triggered small earthquakes in previously seismically stable areas. The effects of structural disruption on the scale involved in fracking is, by its very nature, unpredictable and entails unknowable hydrological (and possibly even seismic) consequences.

Industry spokespeople like to characterize public opposition to hydrofracking as the product of technological ignorance and a fearfulness of the new. However, a huge body of impeccable scientific evidence indicating serious ecological consequences from hydrofracking is appearing in very conservative institutional and media sources. One of the most notable among these is the "Briefing on Hydrofracking" by the EPA in the US obtained by the *New York Times* in 2010 and made available in full on its website. A standard ingredient in the fracturing process is diesel which contains the carcinogenic so-called BTEX chemicals -- benzene, toluene, ethylbenzene and xylenes. However, the industry admits to using other petroleum distillates that contain 93 times the amount of benzene contained in diesel fuel. Since benzene, a proven carcinogen, is considered unsafe in drinking water at levels above five parts per billion, the equivalent of a few drops in a swimming pool, it is impossible to be phlegmatic about the potential risks to health posed by this process. All of this would, on its own, be more than sufficient cause for concern. However, the industry maintains corporate secrecy about the identity of many chemicals in use. Furthermore, according to the EPA, companies were themselves unable to identify what chemicals were incorporated in many of the products they use. More recently, the US House of Representatives
Committee on Energy and Commerce identified 650 known human carcinogens in products used in hydrofracking.

There are numerous other ecological issues as well other concerns related to economic impacts in urgent need of consideration on this matter which, in view of the urgent deadline, I am unable to take time to delineate here. I do however, hope that the government will take the opportunity for a full public discussion of this subject in the form of public hearings.

I also hope that, as a team of advisers with technical expertise, you will consider the full implications of the hydrofracking process, not merely the short-term economic goals of a few corporations and their shareholders.

Yours truly,

Gillian Thomas
Submission by:

Yuill Herbert

RE: Scope of Hydraulic Fracturing Review

Dear Sir or Madam,

The Government of Nova Scotia announced a review of hydraulic fracturing on April 20, 2011. In the background document, the proposed scope included:

- effects on ground-water;
- use [of] and effects on surface water;
- impacts on land, such as potential soil contamination;
- waste management, including surface ponds of produced waters;
- management of additives in hydraulic fracturing fluids;
- site restoration; and
- financial security/insurance.

No rationale was provided for the selection of the list above.

The following comments demonstrate the need for a clarified intent and a significantly expanded review to ensure that the public interest is protected. In the process of compiling this analysis, it is clear that there is considerable uncertainty with respect to many of the impacts of shale gas exploration. The body of evidence is, however, rapidly accumulating each month. Three factors alone justify banning hydraulic fracturing:

1. The risk to public health both through air- and water-borne and pollutants. There is a paucity of evidence in this field, but the risks are significant.
2. The risk to climate change policy. Hydraulic fracturing may undermine all of the efforts undertaken by Nova Scotia to reduce GHG emissions and disrupt the efforts to build a green economy.

2011-06-06
3. Social disruption. There is very little documentation of this, however shale gas development divides communities and pits one fraction against another. Social capital is a defining aspect of the resiliency of Nova Scotian communities and jeopardizing this could undermine what is Nova Scotia's greatest strength.

Sincerely,

Yuili Herbert
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1. Comments on the review process

1.1. Legitimate purpose: The review is misleading. As stated in the background, its purpose is to improve regulations on hydraulic fracturing and not to assess the impacts of hydraulic fracturing. The specific quote is as follows: "a set of recommendations will be submitted to the Government of Nova Scotia to improve current provincial regulations into shale gas hydraulic fracturing". It is therefore not addressing the question of whether hydraulic fracturing is in the best interest of the citizens of Nova Scotia. This assumption is particularly questionable given that other jurisdictions such as France have deemed otherwise.

1.2. Impartiality: The background states that "a set of recommendations will be submitted to the Government of Nova Scotia to improve regulations...". The Government of Nova Scotia is conducting the review. It cannot therefore submit regulations to itself; this is illogical and illustrates that the review has no degree of impartiality.

1.3. Scientific rigour: The proposed scope illustrates that no systematic consideration of the potential impacts on humans nor on the ecosystem was undertaken. There is no mention of a scientific panel or the use of the precautionary principle which is appropriate to policy decisions with a high degree of uncertainty.

1.4. Transparency: The review is being conducted behind closed doors by secret agents. There is no way for citizens to know which experts are being consulted and which research is being reviewed.

1.5. Procedural matters: The background that accompanied the press release does not provide a timeline that indicates the phases of the process and when public input will be received.

The reasons above illustrate that it will be very hard for citizens to place any level of trust in this process.

2. Revised purpose of the review

An explicit terms of reference for the review needs to be prepared including the following statements:
The Hydraulic Fracturing Review will provide a written report to the legislature on the impacts for the citizens of Nova Scotia of hydraulic fracturing. It will be governed by the following principles:

A. Materiality: The principle of materiality shall be applied to this review. Materiality is defined if there is evidence that the impact has the potential to have a significant impact to human or ecosystem health, it shall be addressed.

B. Independent sources of information: The review will use research which was not funded by industry or industry interest groups.

C. Peer review: An independent panel of scientists in the fields of geology, ecology, population health, engineering, climatology and economics will provide a third party assessment of the report.

D. Transparency: All sources of information used in the review will be clearly cited including reports, interview, testimonials and research activities.

E. Precautionary Principle: in the absence of scientific certainty, the precautionary principle will be applied according to principle 2b(ii) of the NS Environment Act. 1994-95, c. 1, s. 1: "the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation."

F. Cumulative Impacts: From the perspective of industrial activity, each hydraulic fracturing well is a relatively small project. However the cumulative impact of hundreds and even thousands of wells transforms that picture. As a result it is critical that the review considers several scenarios for the industry as a whole. Scenarios will include:

- 20 wells
- 200 wells
- 1000 wells

3. Inter-departmental co-operation

As stated in the press release, the review is being conducted by the Nova Scotia Departments of Environment and Energy. As demonstrated below, there are material impacts on health, economic development, infrastructure, agriculture and municipalities. The review must therefore be expanded to include the Departments of Health, Economic and Rural Development and Tourism, Transportation and Public Works and Agriculture.

4. Water impacts

5
Materiality:
Hydraulic fracturing uses significant volumes of potable water, between 2 to 4 million gallons per well (API, 2010a; GWPC and ALL Consulting, 2009; Satterfield et al., 2008). This water is mixed with chemicals and sand and injected underground. A portion of it returns to the surface and must be treated prior to disposal. Osborn et al. (2011) demonstrated conclusively that natural gas was migrating from hydraulic fractured wells to groundwater nearby.

Scope:
With the exception of the site restoration and financial security insurance, the proposed scope focuses primarily on water. A systematic method to consider the impact of hydraulic fracturing on water is to consider the life-cycle of water use:

- **Water Acquisition**: How might large volume water withdrawals from ground and surface water impact on water resources?
- **Chemical mixing**: What are the possible impacts of releases of hydraulic fracturing fluids on water resources?
- **Well injection**: What are the possible impacts of the injection and fracturing process on water resources?
- **Flowback and produced water**: What are the possible impacts of releases of flowback and produced water on water resources?
- **Wastewater treatment and waste disposal**: what are the possible impacts of inadequate treatment of hydraulic fracturing wastewaters on water resources?

5. Ecosystem risks

Materiality:
The NS Environment Act. 1994-95, c. 1, s. 1.; 2b(i) “the principle of ecological value, ensuring the maintenance and restoration of essential ecological processes and the preservation and prevention of loss of biological diversity.”

Hydraulic fracturing activities pose a risk to the ecosystem through contamination (Parasiewicz, 2011), flow reduction of waterways and by spreading invasive species. The number of vehicle trips associated with high-volume hydraulic fracturing, particularly at multi-well sites, has been identified as an activity which presents the opportunity to transfer invasive terrestrial species. Surface water withdrawals also have the potential to transfer invasive aquatic species.
Scope:
- Water withdrawals for hydraulic fracturing;
- Assess potential pathways to distribute invasive species, and
- Develop worst case contamination scenarios.

6. Air pollution

Materiality:
Both nitrous oxide and sulphur dioxide will be emitted from flaring on drill sites. Other air pollutants include hydrogen sulphide (Natural gas can contain up to 28% hydrogen sulphide) (Golder Associates Africa, 2011):

The gas has a characteristic rotten egg odour at low concentrations. The 50 percent odour recognition threshold is about 8 parts per billion (ppb) in air. More than 90 percent can smell it at levels of 50 ppb. At higher concentrations, hydrogen sulphide rapidly deadens the sense of smell. For most people, this occurs at approximately 150 parts per million (ppm).

Since hydrogen sulphide is heavier than air, it could potentially settle in low-lying areas where, if present in high concentrations, could injure or kill livestock, wildlife, and human beings. Common symptoms of exposure to long-term, low levels of hydrogen sulphide include headache, skin complications, respiratory and mucous membrane irritation, respiratory soft tissue damage and degeneration, confusion, impairment of verbal recall, memory loss, and prolonged reaction time. Exposure to high concentrations can cause unconsciousness, known as "knockdown," and can be lethal.

The World Health Organization (WHO) has an air quality guideline of 150 μg/m3 (10.6 ppb) averaged over a 24-hour period. This guideline is based on the avoidance of eye irritation. WHO recommends that hydrogen sulphide concentrations not exceed 0.005 ppm (5 ppb; 7 μg/m3), over a 30-minute period, to avoid substantial complaints about odour.

Other air pollutants include volatile organic compounds such as benzene, toluene, ethylbenzene, xylene and formaldehyde. Benzene is a known carcinogen, toluene may affect the reproductive and central nervous system and Ethylbenzene and xylene may have respiratory and neurological effects.
The Environmental Goals and Sustainable Prosperity Act has established targets for two pollutants released by flaring:

4(2)(c) emissions of nitrogen oxides will be reduced by twenty per cent by the year 2009 relative to emissions in the year 2000;
4(2)(d) sulphur dioxide emissions will be reduced by fifty per cent by the year 2010 from sources existing in 2001;

Scope:
Air pollution impacts will be assessed for each type of air pollutant in each phase of development with consideration given to the topography and weather conditions of Nova Scotia:

- Site preparation
- Transportation
- Equipment
- Drilling
- Flaring
- Decommissioning

The cumulative assessment will assess the impacts of different densities of drilling operations.

7. Workplace safety

Materiality:
On March 7, 2011, BBC reported that 11 people were injured in a well explosion during a hydraulic fracturing process in Edson, Alberta (BBC, 2011).

The oil and gas extraction industry has an annual occupational fatality rate eight times higher than the rate for all U.S. workers (NIOSH, 2009). The National Institute for Occupational Safety and Health (NIOSH) reports that fatality rates increase when the level of drilling activity increases, possibly because of an increase in the proportion of inexperienced workers, longer working hours, and the utilization of all available equipment, including older equipment with fewer safeguards (NIOSH, 2009).

Potential and acute and chronic health effects associated with worker exposure to hydraulic fracturing fluid chemicals including transport, mixing, delivery and potential accidents (e.g., high pressure leak, valve, pipe, or tank failure) has not been well characterized. It is currently the subject of study by the Centre for Disease Control (CDC) in the US.
Scope:
- Evaluate the track record;
- Review incident reports from across North America;
- Identify potential risks at each phase of the activity;
- Methodology for communicating those risks to workers;
- Safety requirements for chemical use; and
- Capacity to treat in the case of accidents.

6. Public health risks

Materiality:
Scientists have previously claimed that the low concentrations of chemicals meant that hydraulic fracturing posed no danger to public health. Colborn et al. (in press) challenge that assumption, particularly when considering endocrine-disrupting chemicals.

"The technology to recover natural gas depends on undisclosed types and amounts of toxic chemicals. A list of 944 products containing 632 chemicals used during natural gas operations was compiled. Literature searches were conducted to determine potential health effects of the 353 chemicals identified by Chemical Abstract Service (CAS) numbers. More than 75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40-50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations."

There are a range of incidental stories about the impact of hydraulic fracturing chemicals on health, including by a nurse who treated a worker exposed to hydraulic fracturing chemicals (Frankowski, 2008).

A comprehensive literature review identified 15 different public health risks associated with hydraulic fracturing activities (Witter et al. 2008). A separate report by PennEnvironment Research and Policy Center (Madsen et al. 2011) details anecdotal health impacts of natural gas extraction, a number of which are resulting in legal actions.

The Health Protection Act provide authority for an intervention by the medical health officer. Health Protection Act, 2004, c. 4, s. 18 (1) A medical officer may conduct risk assessments in relation to existing or potential health hazards.
Scope:

- **Risk levels**: Assessment of the risks from air pollution, water contamination, traffic, noise, community wellness, economy, health care infrastructure and accidents and malfunctions.
- **Population characteristics**: What are the characteristics of the populations that would be impacted? Susceptibility is influenced by age, nutritional habits, physical condition, medical condition, drinking and smoking, sensitization and pregnancy.
- **Health effects**: What are the health impacts? Respiratory system: Irritation, headache, pulmonary edema, asthma, systemic poisoning, degenerative diseases. Gastrointestinal tract: Contaminated water, low level effects, systemic effects involving many organs, degenerative conditions. Eyes and skin: Irritation, drying out, defatting, inflammation, burns.

9. Seismic Risks

Materiality:
There have been inconclusive reports of earthquakes as a result of hydraulic fracturing in US shale gas plays. On June 1, 2011, hydraulic fracturing was suspended as a result of two earthquakes in the which earthquake experts from the British Geological Survey was quoted as saying (Connor, 2011):

"It seems quite likely that they are related [to the hydraulic fracturing activities in the area]." said Brian Baptie of the British Geological Survey (BGS). "We had a couple of instruments close to the site and they show that both events were close to the site and at a shallow depth...
"The timing of these two events in conjunction with the ongoing fracking at the site suggests that they may be related." He added: "It is well-established that drilling like this can trigger small earthquakes.

Scope:
The relationship between earthquakes and hydraulic fracturing is uncertain. Results of all previous studies that investigated the relationship will be reviewed and experts from the British Geological Survey will be consulted on their analysis of the Blackpool incident.

10. Greenhouse gas emissions:
Materiality:
The Environmental Goals and Sustainable Prosperity Act 4(e) greenhouse gas emissions will be at least ten per cent below the levels that were emitted in the year 1990 by the year 2020, as outlined in the New England Governors and Eastern Canadian Premiers Climate Change Action Plan of 2001.

To comply with the law, Nova Scotia will have to eliminate about five megatonnes (MT)—or five million tonnes—of carbon dioxide emissions from current levels. Allowing shale gas exploration and development will substantially increase GHG emissions in NS. Between 100 and 200 wells will contribute an additional MT over ten years.

Based on emissions numbers reported by Howarth (2011), each well will contribute up to 740 tCO2e per year, equal to the emissions from 40 households.

Scope:
Evaluate the literature on GHG emissions from each phase of the process including transportation, drilling, flaring and decommissioning. Develop scenarios for industry growth and the impacts on the Government of NS's GHG targets.

11 Economic impacts

Materiality:
It is clear that that shale gas development generates significant expenditure. But the socio-economic costs of that development is not well understood. The distribution of costs and benefits can have a significant impact on local communities (Ecosystem Research Group, 2008).

• Cost of living can increase benefiting high-paid industry workers but leaving local residents behind;
• Tax benefits can be much lower than expected; and
• House prices can increase significantly.

Employment benefits may not be as extensive as anticipated. While a single well requires up to 410 individuals from nearly 150 different occupations, this translates into just 11.5 full-time jobs and in the long term just 17 full time jobs per 100 wells (Brundage et al. 2009). Additionally, many of the employment consists of a transient workforce that can represent a fluid unaccounted for pressure on local infrastructure.

11
A focus on natural gas development can also restrict innovation and limit the transition to a green economy (Headwaters Economics, 2008). A study by Headwaters Economics found that in comparison with communities that focused on other development paths, energy-focused communities were characterized by:

- Less economic diversity and resilience
- Lower levels of education in the workforce
- A greater gap between high and low income households
- A growing wage disparity between energy-related workers and all other workers
- Less ability to attract investment and retirement dollar

Scope:
An extensive review of the public and private costs and benefits needs to be completed. This would include:

Benefits:
- Provincial royalties
- Municipal taxes
- Direct and in-direct corporate expenditures
- Employment expenditures (localised and non-localised)

Costs:
- Infrastructure repair and upgrade (municipal)
- Health costs
- Non-violent crime
- Disruption to agriculture
- Disruption to tourism
- Abandoned wells
- Waste treatment
- Administrative and monitoring costs

12. Social impacts

Materiality:
The social impacts of shale gas are not well documented. They can include community conflict, decreased community satisfaction among old-timers, disparate economic benefits, decreased social relations and social isolation of newcomers (Jacquet, 2009).

Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. There are concerns that hydraulic fracturing may adversely affect some communities that may be more likely to be exposed to harmful chemical contaminants as a result of fracturing activities, particularly through contaminated drinking water resources. People with a lower socioeconomic status may be more likely to consent to drilling arrangements because they may not have the resources to engage with policymakers and agencies to affect alternatives. Additionally, drilling agreements are between landowners and well operators, implying that tenants and neighbours may have little or no input in the decision-making process (US EPA, 2010).

Scope:
Review of the literature on the community impacts of primary resource development.
Bibliography


Dear Sir or Madam;

I have great concerns about the process called Fracking. I know there are also concerns about the environmental impacts of this process on soil and the aquifer. My major concern is with the process and more specifically the water used in the process. Water cannot be replaced or new sources found. The water we have is all we have. Water moves everywhere and anything put in water goes with it. The process of fracking permanently pollutes millions of litres of water. This water cannot be rehabilitated with any known procedure. I am calling for a moratorium on the fracking procedure in our province for these reasons. I also believe that if we do not allow this dangerous procedure and the pressure to 'get at the gas' increases as the prospective profit margins increase this will spur on research into other safer and better technologies.

To go back a few years for an analogy - people pressed for the abolition of slavery just because it was wrong regardless of the effect on the economy. New a better technologies were developed to replace the 'free' labour.

We need and deserve better for now and in the future. Even dogs don't mess in their own beds.

Sincerely,

Virginia Redden

- Ovambo Namibia
From: "Jennifer West" <groundwater@ecologyaction.ca>
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 11:05 AM
Subject: FW: NOFRAC another letter re fracking
Attachments: letter re fracking.doc
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442, Halifax, NS, B3J 2P8

By e-mail: frac-review@novascotia.ca

Dear Team of Senior Technical and Policy Staff,

I appreciate the opportunity to provide written comments on the scope proposed for a provincewide review of fracking. Although I live within the Windsor Block, for which Triangle Petroleum has a production lease, I had not been aware until recently that fracking had been used in some wells in Hants County and that it is being considered for more sites. Although I attended the Open House in Summerville in 2009, there was no public mention and/or explanation of fracking during the time (almost 2 hours) that I was present. Others who gave permission for seismic testing didn't seem to realize that the next step could involve fracking. If fracking is even being considered for an area, the first condition should be open public consultation with members of the communities.

After learning about this opportunity for input, I've checked on information about fracking taking place in other areas. I am extremely concerned about the numerous serious consequences reported.

On Feb. 26, 2011 The New York Times reported that waste water from fracking is sometimes hauled to sewage plants not designed to treat it, and then discharged into rivers that supply drinking water. The water was found to contain radioactivity at levels higher than previously known, and far higher than the level that federal regulators say is safe for these treatment plants to handle. With uranium naturally occurring in this area of the province, there is potential for radioactive particles to be present in the waste water of any fracking done in this region. I've been informed that we do not have water treatment plants in NS that can handle radioactive waste.

This raises questions such as:

Where would waste water be treated?

What safeguards would be in place if the vehicle was in an accident?

What is the source of the water?

What limits are on quantities used?
NS currently has some of the highest rates of cancer in the country. People in this area are being encouraged to participate in the 'Atlantic Path- Partnership for Tomorrow’s Health’ study. Water testing is part of this study to determine if exposure to arsenic and other chemicals may be a factor in the development of cancer and other diseases. It seems extremely counterproductive to allow millions of gallons of water containing chemicals to be injected into our ground, that will in turn result in waste water that may contain arsenic and/or radioactive particles, along with numerous other chemicals.

Like many in rural NS, people in our local communities rely on well water for drinking. After reading the Duke study that was published in the Proceedings of the National Academy of Sciences in May 2011, I have to wonder if decision-makers have really studied the ramifications for us in their consideration of the use of fracking in NS.

Research conducted by four scientists at Duke University found that levels of flammable methane gas in drinking water wells increased to dangerous levels when those water supplies were close to natural gas wells. The water samples taken closest to the gas wells had on average 17 times the levels detected in wells further from active drilling. They also determined that the type of gas detected at high levels in the water was the same type of gas that energy companies were extracting thousands of feet underground. This indicates that the gas could be seeping underground through natural or manmade faults and fractures, or coming from cracks in the well structure itself.

This research adds validity to Dr. Anthony Ingraffea's view that joints will open in unpredictable ways when fracked. Dr. Ingraffea, who has a PhD in Rock Fracture Mechanics, points out that fracking is really re-fracturing existing fractures. His theory easily explains why water samples taken from wells closest to gas wells would have higher levels of methane. It also gives a reasonable explanation for 'communication incidents', where fracking materials injected in one well show up in another. Several of these incidents have been reported from British Columbia.

The importance of clean and available water cannot be overstated. A recent poll by the Canadian Union of Public Employees found that 87% of those surveyed believe that "water is our most precious resource" and government needs "to ensure that we retain public control over water" (The Chronicle Herald, June 4/11).

The scope of this review on fracking needs to be much broader and needs to include the effects of fracking on air quality and health. In the small town of Dish in Texas that has a high concentration of shale gas wells, the air quality was tested after a large number of residents started getting sick. The air was found to contain high levels of cancer-causing chemicals. Follow-up blood testing revealed those same chemicals present in levels above the currently acceptable levels in half of the people assessed. It was determined that these carcinogenic chemicals were in the 'slickwater' used when fracking.

A study by Theo Colborn et al confirms the presence of these chemicals in the list of
those used and produced in drilling and fracking in "Natural Gas Operations From a Public Health Perspective". It will be published this fall in the International Journal of Human and Ecological Risk Assessment. The potential health effects of the 353 chemicals identified by Chemical Abstract Service (CAS) numbers were assessed. They found that more than 75% of the chemicals could affect the skin, eyes, and other sensory organs, and the respiratory and gastrointestinal systems. Approximately 40-50% could affect the brain/nervous system, immune and cardiovascular systems, and the kidneys; 37% could affect the endocrine system; and 25% could cause cancer and mutations. They also discussed unpredictable delayed, life-long health effects on individuals and/or their offspring, and I quote:

"Industry representatives have said there is little cause for concern because of the low concentrations of chemicals used in their operations. Nonetheless, pathways that could deliver chemicals in toxic concentrations at less than one part-per-million are not well studied and many of the chemicals on the list should not be ingested at any concentration. Numerous systems, most notably the endocrine system, are extremely sensitive to very low levels of chemicals, in parts-per billion or less. The damage may not be evident at the time of exposure but can have unpredictable delayed, life-long effects on the individual and/or their offspring. Effects of this nature would be much harder to identify than obvious impacts such as skin and eye irritation that occur immediately upon contact. Health impairments could remain hidden for decades and span generations. Specific outcomes could include reduced sperm production, infertility, hormone imbalances, and other sex related disorders. Further, compounding this concern is the potential for the shared toxic action of these contaminants, especially those affecting the same and/or multiple organ systems." p.11.


Ministers Parker and Belliveau have stated, “We understand Nova Scotians want assurances from their government that our drinking water is safe and our environment is protected. That is why it is important that we make decisions based on facts and science for the recommendations before making a decision on the future of shale gas hydraulic fracturing. I can assure all Nova Scotians that if a proposed activity has not demonstrated that it can be done right, it will not be approved.”

The number of independent scientific studies and documents indicating detrimental environmental and health effects from fracking is growing. I believe that a strategic environmental assessment is needed to determine the short and long-term risks of fracking. It should assess not only the risks and costs from environmental and health effects, but include the economic impacts on agriculture and tourism, and a true and complete accounting of greenhouse gas emissions involved in the total process. Full public consultation is imperative. I believe that a moratorium should immediately be put in place as science already shows the potential for irreversible damage from fracking.
This decision on fracking presents an opportunity for government to think proactively and keep our provincial environmental and health costs in check. Using the precautionary principle and prohibiting practices such as fracking, that put our water resources and health, and those of future generations at risk, would be a huge step in the right direction.

Respectfully submitted,
Barbara Gallagher

cc: Chuck Porter, Hants West MLA
Andrew Younger, Liberal Environment/Energy Critic
Allan MacMaster, Conservative Environment/Energy Critic
From: <frac-review@gov.ns.ca>
To: 6/6/2011 11:10 AM
Date: Frac review
Subject:

The proposed review for fracking in NS is unacceptable. The scope of the review is missing vital and important areas such as air quality, environmental impacts on forests, wildlife, aquatic life, health and economic impacts on tourism, farming, fishing, property values and degradation of infrastructure. There are already too many reports on the negative impacts of fracking with more coming in daily.

The oil and gas industry claims they can do fracking in a safe manner. One doesn’t have to look far to see all the lawsuits against these companies and the damage they caused. Law-suits are now emerging in Alberta, Quebec, New Brunswick and Ontario to name a few. Cigarette companies claim that cigarettes don’t cause cancer or ill health effects.

The economic impacts are not all they are claiming to be. There has been little actual, current, unbiased information to support economics. It has been asserted more than proven. Taking into account the costs of environmental destruction, damage, health effects, wear and tear on roads, pollution, and detrimental effects on communities, the reports are inaccurate.

Fracking procedures now use up to 4 million gallons of water, with up to 1 million gallons of lethal frac fluids - just how do you propose to dispose of this?? NS does not have the infrastructure to deal with that much hazardous waste. The mentality to dump it on the ground in big pools is unacceptable.

Fracking needs to be banned from NS - period. To have this crammed down our throats in the name of greed is absolutely disgusting.

Stephanie Melanovich
-----Original Message-----
From:
Sent: Fri 6/3/2011 8:54 AM
To:
Subject: Re: NOFRAC Lots more letters!

my letter attached
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442. Halifax, NS, B3J 2P8

By e-mail: frac-review@gov.ns.ca

My name is Ken Summers

There were a lot of questions when the company held its open houses for the community. But they seemed to have all the answers and this was before any of us had heard of hydraulic fracturing in the United States. Had the company been proposing a drilling program now, I am certain they would have got an entirely different reception from us.

The N-14-A well is a few hundred metres from Noel Lake, and is within a designated Department of Natural Resources wetland. Yet 85% of drilling fluids were not recovered. With the typical percentages of chemical additives, that means tens of thousands of hazardous wastes simply disappeared.

If I spill as little as one hundred litres of furnace oil, remediation is required. The reason for those regulations is the potential contamination of groundwater- there is no waiting for proof that the spill will harm groundwater.

But even with just a short track record of several wells drilled in Nova Scotia, hydraulic fracturing has already loosed a magnitude of hundreds times more hazardous waste- into a designated wetland no less. Yet the opposite principle applies as does to far smaller furnace oil spills: it is an acceptable risk because the hazardous wastes “only” might contaminate ground water.

Another major escape of drilling fluids, on a much larger scale, took place late last year with Apache Canada’s horizontal bore fracking of the Frederick Brook Shale in New Brunswick. In fact, Apache just announced that they are pulling out of the joint venture completely. This company with deep experience in shale bed fracking has decided on economic terms- let alone environmental concerns- that there are just too many unknowns with drilling in Maritimes Basin shale beds.

I urge that the review seriously consider the merits of leaving the resource in the ground at this point in time. It will be several years before gas prices even might rise high enough that the province will earn any more than the marginal rents on the resource typical right now. Not to mention that in areas new to it, the industry right now expects to get the resource virtually without royalty cost. In several years the industry will also have been
pressed into improving its practices.

I am also very concerned about the greenhouse gas emission effects of the entire production process of hydraulic fracturing for gas. When the entire cycle is considered, there is no evidence that burning fracked gas for electricity production is any better than burning coal.

The states that regulate the industry in the US have refused to require the gathering of data on fugitive emissions in the production cycle, and the federal EPA has thus far not been allowed to gather the data. This will probably change in the near future, providing data that will give us a basis for making informed choices—another compelling reason not to rush to take a pause on development in Nova Scotia.

Our government needs to considerably expand the scope and time frame of this assessment beyond the stated review of technical literature and of so called industry “best practices.”

First it needs to be demonstrated that there is a single jurisdiction out there that has diligently assessed all the factors involved in hydraulic fracturing. All of the US state regulators have followed the industry’s lead: frack first, ask questions later (maybe).

Following the lead and the questionable track record of the US states and British Columbia is just not good enough for Nova Scotia.

Sincerely,

Ken Summers
-----Original Message-----
From: Paul Pross [mailto:cpross@eastlink.ca]
Sent: Fri 6/3/2011 8:29 AM
To: Jennifer West
Subject: Submission to fracking review

To: frac-review@gov.ns.ca

Re: Hydraulic Fracturing Review

Like most rural Nova Scotian families, we are dependent on local ground water. Consequently, even the possibility that hydraulic fracturing might be permitted as a part of oil and gas exploration and extraction in this province is a matter of concern to me. I urge you to prohibit the practice on the following grounds:

1. Environmental - There is considerable evidence that fracking leads to contamination of groundwaters both near and some distance from the actual site of the fracturing exercise. Contamination can come from the chemicals used in the process and from the release of methane within the well itself. [See Stephen G. Osburn, Avnor Vengosh, Nathaniel R. Warner and Robert B. Jackson, 'Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing'. Proceedings of the National Academy of Science, May 9, 2011.]

2. Economic - To support fracking processes the Province would incur costs that would probably exceed the economic benefits. These costs would include improvement and maintenance of highways used by heavy trucks to transport the large quantities of water needed for the process. The costs of storing and rehabilitating whatever water which can be recovered must also be considered. Doubtless there are other infrastructure costs that the Province would incur.

It appears, as well, that the few benefits that flow from tapping shale gas are short-lived. Wells are soon exhausted; the companies move on, leaving contamination in their wake and an expensive clean-up operation to be carried out by local and provincial governments.

3. The Precautionary Principal - In March, 2009, the AGM of the NS NDP unanimously adopted an 'Environmental Framework' policy. The policy includes a commitment to avoid actions whose outcomes are unknown but might reasonably be thought to harm the environment (including public health). Surely this 'precautionary principal' should apply in this case. There is ample evidence that fracking causes pollution and some evidence that the chemicals used in the process are carcinogenic. [U.S. House of Representatives. Committee on Energy and Commerce. 'Chemicals used in hydraulic fracturing'. Washington, D.C., April, 2011.]

Admittedly, the public cannot assume that the policies of the NS NDP should be the same as those of an NDP government. Nevertheless the public is entitled to believe that an NDP government would strive to live up to the pre-election commitments of the Party and to be judged by the electorate in light of those commitments.

Paul Pross,
From: <frac-review@gov.ns.ca>
To:  
Date: 6/6/2011 11:44 AM
Subject: Re: Submission to Review of Hydraulic Fracturing for Shale gas

Hello All,

Excellent work! This was my bedtime reading last night. What a thorough, comprehensive document. Thank you to any others who may have contributed. We are standing tall on this hugely important issue.

Sheila

--- On Sun, 6/5/11,

From:
Subject: Submission to Review of Hydraulic Fracturing for Shale gas
To: frac-review@gov.ns.ca
Received: Sunday, June 5, 2011, 9:38 PM

Please find pdf attachment to be submitted to Review of Hydraulic Fracturing for Shale Gas on behalf of the Environmental Health Association of Nova Scotia.

Thank you,
Alison Petten
VP-EHANS
From: <frac-review@gov.ns.ca>
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 11:44 AM
Subject: review submission

Please find attached my letter of submission about the natural gas exploration review in Nova Scotia.
Thank you,
James Conley
June 6, 2011

To Whom it Concerns:

RE: Review of Hydraulic Fracturing for Natural Gas

I am writing about the natural gas practice of fracking. I have a small business in the Noel area of Hants County where this practice is supposed to take place in the coming years. Test wells have already been drilled. The more I hear about this the more I become concerned it will contaminate my water supply and even ruin my business as well as other people’s water. If this happens, some will have to pay. Just one bad well will be enough to scare people and keep tourist and other business from coming to this area. I think before this is finalized, we should find out a lot more facts about this practice. It is far too early for the type of review your government is undertaking. We need much more impartial information for the public to have informed input before we consider undertaking this fracking practice.

James Conley
From: <FRAC-REVIEW@gov.ns.ca>
To: <FRAC-REVIEW@gov.ns.ca>
Date: 6/6/2011 11:46 AM
Subject: Re: Submission to Review of Hydraulic Fracturing for Shale gas (Hydraulic Fracturing Review)

Hello All,

My apologies for replying to the list-serve. It was unintentional, but serves to underline the concern that our organization feels about this issue.

Thank you.

Sheila Cole
Board Member - EHANS
--- On Mon, 6/6/11, FRAC-REVIEW FRAC-REVIEW <FRAC-REVIEW@gov.ns.ca> wrote:

From: FRAC-REVIEW FRAC-REVIEW <FRAC-REVIEW@gov.ns.ca>
Subject: Re: Submission to Review of Hydraulic Fracturing for Shale gas (Hydraulic Fracturing Review)
To: 
Received: Monday, June 6, 2011, 10:44 AM

Thank you for your submission. Your comments will be reviewed by staff from the Nova Scotia Departments of Energy and Environment as part of the province’s review of hydraulic fracturing in shale gas operations.

PLEASE NOTE: All submissions from the public will be posted on the Nova Scotia Department of Environment website and will be available for public viewing. You should not include the names of other parties or any other information from which other parties could be identified, unless their permission has first been obtained. As well, if you wish to submit confidential information, or other information that would normally be protected under the provisions of the Freedom of Information and Protection of Privacy Act, separate this information and clearly mark it as such. Even if information is marked as confidential, the Freedom of Information and Protection of Privacy Act may require us to release the information to an applicant under the Act.
From: wilfred woods
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 12:06 PM
Subject: Hydrologic Fracturing - NSFAH Position

At the Annual General Meeting of the Nova Scotia Federation of Anglers & Hunter in March of 2011 a resolution was passed opposing Hydrologic Fracturing as a method of exploration and extraction.

Our position is based on a concern for the ecology of the Province of Nova Scotia and the detrimental effects, known and suspected, that "Fracking" will have on it.

Our primary concern is the effects on fresh water and the drinking water supply. It has been well documented in several Provinces and many of the United States that "fracking" results in drinking water contamination. The process of pumping millions of liters of fracking fluid, which contains hazardous chemicals, into the ground represents a real threat to our drinking water supply. The fact that only about 10% of this fluid is recovered and the other 90% has the potential to migrate to the surface represents a threat to our fresh water system of streams, rivers and lakes and the whole spectrum of wildlife that they support.

These threats are exacerbated by the fact that the fluid will be transported over our highway system on the way to the well site and the recovered fluid must be transported back for shipment to a treatment facility, none of which exist in Nova Scotia. The risk of spills spreads the threat far beyond the well site.

In addition to our concern with the impact on our water resources we are concerned with the negative impact clearing land to create well sites and the new roads required to service them. The well site will require enough cleared space to store millions of liters of fracking fluid and the recovered fluid, as well as all the equipment and casings required to drill a well. These roads and well sites will have a negative impact on the wildlife of Nova Scotia through loss of habitat and interruption to travel corridors. The increased road access will result in greater human activity which has a negative impact on wildlife, in particular the Endangered Mainland Moose which is very sensitive to noise from people, vehicles and equipment.

The threats posed by Hydrologic Fracturing far outweigh any benefit to be realized from the process. Our eco system is far too delicate to accept this process of exploration for marginal return, if any.
W.J. Woods
President
Nova Scotia Federation of Anglers & Hunters
From: Dale Schimpf
To: <frac-review@gov.ns.ca>, <percy@percy.paris.ca>
Date: 6/6/2011 12:15 PM
Subject: Fracking Comments

Hello:

In response to your request for comments regarding a review of fracking in Nova Scotia, please accept my comments below.

First of all, I must say that I find this review process to be flawed and inadequate from the start, simply because it does not ask or allow discussion of the essential and most important question, "Should fracking be allowed in Nova Scotia?". All the NS gov't information I have read seems to be implying that fracking will eventually be allowed no matter what, and all we can do is provide input into developing the regulations and policies around this industry.

Any evaluation of fracking should be based on the precautionary principle as contained in the Environment Act, Section 2 (b) ii, (http://nslegislature.ca/legc/statutes/environment.htm). I have only recently started reading up on fracking and the industry behind it, but it has not taken me very long to find reports of serious and irreversible damage caused to the water table in certain instances. Considering that you don't have to look too far to find these sorts of stories, one has to ask the question, "Why would we want to allow this in our province?". If there is any possibility that our water supply (and our health) could be put at risk whatsoever, why would we want this?

Any review should include all direct and indirect impacts, all risks, and all potential consequences for Nova Scotia, both immediate and long term. The immediate and medium term argument the gov't makes is of course revenue and jobs. That is all well and good but those benefits will be far outweighed by irreversible environmental damage, a seemingly very real by-product of fracking. In my opinion, no amount of money is worth any potential risk of permanent environmental damage or any outcome which has the potential to negatively affect my health.

Some of the potential impacts and risks which should be looked at include environmental impacts (water, soil, air, forests, wildlife), health impacts (cancers, endocrine disruption, respiratory damage) economic impacts (farming, tourism, property values) and impacts on rural communities and rural quality of life. These are just a few. Research into issues from other jurisdictions where fracking has occurred will provide you with a complete list of all issues/risks which should be considered.

The scope of the review should allow for all possible outcomes, including a ban on fracking because it poses a threat of serious and irreversible damage. The result of the review should not be limited, as it currently is, to "making recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." www.gov.ns.ca/nse/pollutionprevention/docs/Scope.Hydraulic.Fracturing.Review.pdf

Any evaluation of fracking should be independent of government and allow for full public participation and access to information.
Thank you for allowing me to submit my comments.

Sincerely

Dale Schimpf
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442
Halifax, Nova Scotia
B3J 2P8

To the Committee Members:

I would like to comment on the proposed scope of your review of hydraulic fracturing in shale gas operations in Nova Scotia.

Like the organization, Stop Fracking in Nova Scotia, I agree that the scope of this review is too narrow. There are too many unknowns regarding long term risks from this specific technique. There is the potential for long term health problems, geological dangers, destruction of natural resources as well as the possibility that local organic farms and vacation properties could be adversely affected.

Canada’s Ocean Playground, with the warmest waters north of the Carolinas, need not become a backwater sewer in the name of industrialization.

There has been much talk regarding proper well construction, but nothing mentioned pertaining to the fact, as per the Canadian Society for Unconventional Gas, that “fractures in oil and gas bearing rocks will extend along ‘the path of least resistance’, at any point in the zone of interest”, and I expect, beyond. When you crack an eggshell do you know where the fracture line will go?

I would like to leave you with one final thought: First do no harm.

Thank you for your consideration of the issues.

Sincerely,

Pamela Langille

cc Ms. Karen Casey MLA
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 12:29 PM
Subject: Comments re fracking review

6, 2011

Departments Of Energy and the Environment

Re: the Scope of Hydraulic Fracturing Review

To Whom It May Concern:

As a citizen of this province and a rural landowner in West Hants I have very serious concerns about this review.

1) The scope is much too narrow to allow for the real question: should we allow fracking in Nova Scotia at this time?

There is much controversy over this practice in many parts of the world. The environmental and health hazards have been documented in many places, including the US (see the EPA report published by the New York Times, Feb. 2011). Whether the costs are worth the benefit and who bears the costs are serious concerns, especially in a small province like Nova Scotia where wells, farms and rural dwellings, farm land and forests would be very close to the drill sites, waste-holding ponds, and probably the associated compressor stations.

The practice is wasteful of water: they need 11.5 litres of water to frack just one well. 260 chemicals are used in the “special sauce” used in the process, many of which, most notably benzene, are known carcinogens.

One drill well can produce a million gallons of wastewater laced with highly corrosive salts, carcinogens, as well as naturally-occurring but hazardous radioactive elements like radium. We already
know that NS has uranium deposits with naturally occurring radiation above background levels in many locations.

The risks of contaminating surface and ground water is obvious and has been documented in the US in New York State and in Pennsylvania. The May 10, 2011 issue of Scientific American cites the proceedings of the National Academy of Sciences regarding the potentially harmful levels of methane in drinking water near drilling sites in these two states.

We know we need to conserve our water resources for ourselves and as well as for future generations. In a world of climate change, water is becoming an increasingly precious commodity.

There is also air pollution associated with the process: benzene and toluene have been found in air samples near drill sites. Vulnerable people, such as children, are having trouble with asthma attacks and breathing near drill sites. Nova Scotia already has high asthma rates and a health care system under stress—we don’t need to introduce more problems into our midst.

In other words, it’s a dirty process with potentially devastating short-term and long-term consequences.

2) Why is there an unnamed committee meeting behind closed doors over such an important issue? Who are these experts?

We need to have a public inquiry into these issues along the lines of the Natural Resources Strategic Review undertaken over the past two years.

3) Why does the website for the Review say there is no real activity in NS and not likely to by any this year when other sources document that three companies (Eastrock, Forent, Petroworth) have exploration licenses for petro-hydrocarbons and have said they plan to use fracking in the process?

This kind of misinformation does not inspire trust and confidence, especially when the Review is behind closed doors.

We can and have done much better than this on other controversial environmental issues in this province. I suggest that the government should rethink its strategy on this one and begin to show some degree of trust in its own citizens and some apprehension of our “right to know” when our lives and livelihoods are at stake.
Yours truly,

Donna E. Smyth
From: Catherine Hughes  
To: <frac-review@gov.ns.ca>  
Date: 6/6/2011 12:54 PM  
Subject: Comments on hydraulic fracturing review

To whom it may concern,

We would like to comment on the review of hydraulic fracturing that is planned in Nova Scotia. We believe the proposed terms of the review are too narrow and do not give nearly enough weight to community concerns about hydraulic fracturing in particular and oil and gas development in general. It is not enough to "ensure industry and regulatory best practice is being employed in the province." Many people who live in areas where gas development could take place are opposed to hydraulic fracturing because of the risks it poses to air and water quality, to their health, to wildlife and to ecosystems. We think we need to ban hydraulic fracturing. The pumping of water, sand and chemicals (some that have been shown to be extremely toxic) at high pressure deep underground cannot be regulated to the point where it is safe.

We presented Charlie Parker with a petition to ban fracking in Nova Scotia signed by over 1200 people at a protest on March 21st, 2011. The petition has since then been signed by many more people. At the time of the protest 279 people had signed an online petition against fracking. After we lose our water, regulations wont do us any good. What do we have to do to stop this.

We object to a statement made by Energy Minister, Charlie Parker in letters to people who wrote to him objecting to fracking. He wrote that "renewable energy will not replace fossil fuels in our lifetime." We think we do need to end our addiction to polluting, green-house gas creating fossil fuels in our lifetime. Maybe the use of fossil fuels will not be completely eliminated, but the science of climate change paints a very scary picture if we don't move quickly away from them. Nova Scotia should be doing all it can to limit our use of energy and produce it in a much less destructive manner than through the continued production and use of fossil fuels. The province should not be getting deeper into a dependence on fossil fuels through development oil and gas. Shale gas that is obtained through fracking should not be considered a transition fuel because too much energy is used to access it.

Sincerely,

Catherine Hughes & June Daley
From: Bev Phillips
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 12:56 PM
Subject: Should we be fracing in NS?

I am submitting comments relating to the province’s review of hydraulic fracturing. This is a very serious issue facing communities large and small across North America, and as many of them have instituted moratoriums as they have had problems arise, I would like to see Nova Scotia institute a ban on this method of oil and gas extraction.

Fresh water is this planet’s most precious resource and Canada has been blessed with an abundance of it. With climate change, it is anticipated to become even more valuable in the future and that future wars may be over water. Fracing uses a great deal of fresh water in its operations and once used it is contaminated and no longer usable or even accessible to return to the water cycle. Wells have been both lost and contaminated. Feed lots have seen animals die. Farmers that once thought they were operating organically discover that fraced wells nearby changes everything for them. Some farms shut down since their water supply is gone. Is it wise to risk the water source for not just this generation but for future generations to come for money today? What will our grandchildren think when the freshwater available to them is very limited and very expensive?

Furthermore, new research indicates that fracing causes increased release of methane, which is an even more dangerous global warming compound than carbon dioxide. The dangers of fracing lie not just with what it may do to the water we drink, bathe, swim in and use to irrigate our crops, but also to the overall climate change picture. Yes, natural gas may be more carbon friendly to burn than coal, but this extraction method and methane release may make it overall a greater greenhouse gas emitter. I urge the government to consider this aspect as well as it ponders the future of fracing in this province.

Also, what will fracing do to the landscape of Nova Scotia? How will it change its natural beauty? How much forest will be cut down to accommodate operations? People come to NS for its slower pace of life and to see its lakes, rivers and forests, not to see an industrial landscape with a lot of heavy truck traffic. How will the province maintain the roads in these areas of increased trucking due to the wells? NS roads are already in terrible shape and hydraulic fracturing will lead to greater disrepair. Is the government willing to upgrade paving standards and to repave more often as the roads are ruined?

Nova Scotia is a beautiful part of the country and it would be a shame to let it fall victim to the corporate greed of oil and gas companies that only look out for themselves. Nova Scotians will not even get to enjoy the benefits from natural gas heating and electricity as most of it will go to serve the USA. We will simply be left with the environmental degradation and clean-up bill. It is a known fact that poverty and environmental degradation go hand in hand as poor areas are willing to put aside the best interests of the local people for some quick money. Short term gain can lead to long term pain. I hope Nova Scotia does not make that mistake.
Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracing in Nova Scotia.

/Sincerely,

/Beverley Phillips/
From:
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 1:17 PM
Subject: Letters from Children of
Attachments: letters.pdf

Attached are letters written by the grade 6 class in . They are addressed to Karen Casey and the paper copy will be sent to her office.

Thanks
Dear Honorable Karen Casey,

I believe that there would be no fracking in the North Shore because of the dangerous risk of polluting our water supply.

I have watched a short clip about fracking. I saw that because of the gas that pools out while fracking, some people can light their water on fire. As you know, fracking can ruin your water. Once your water is toxic, there is no getting it back.

Fracking can also cause stress, mental, and physical damage. Sometimes the gas gets into your property and ruins everything. We have seen that serious health issues from fracking. There is fracking here we may have to move away.

Do a small test on your community, we will not give up until the job is done. We will not stop fracking if it seriously damages the water supply.

Sincerely,
Dear Honorable House Lady,

I believe that fracking can affect the people and animals in our province. Fracking can directly and indirectly harm the people and animals.

Fracking can affect many people with health issues. It is said that fracking has been linked to health problems. This means people have an expectation to be healthy. It is clear that people can be affected. Fracking can affect the water supply. It is important to note that water is a basic need for life. Without water, life can not be sustained.

Another problem with fracking is that it can affect the environment by killing the wildlife and plants. It can kill many animals, other than fish. It can destroy many trees and lands. It can kill the wildlife. This should be prevented.

Fracking can also pollute the air and water. It can pollute the air, by producing gases, dust, and other harmful materials. It can pollute the water, making it unsafe for use.

Yours sincerely,

[Signature]
animals and keep them alive.

In the wild, the birds will spread their wings and fly to the skies to find new homes that will not poison them.

Fracking can pollute our water, killing animals, the environment, our lands, and other life. Once our water is gone, it’s gone.

Sincerely,

[Signature]

[Grade & Student #:]
I believe fracking is very dangerous for our environment and everyone in it. Because there will be lots of air pollution from trucks carrying the water and chemicals. If it affects someone's well and they don't know about it it could harm or kill them.

The natural gas that they get from fracking is not a clean fuel source. And you can't replace it as it is non-renewable so it's not viable for all the awesome things in nature that use depleting.

Fracking affects farmers, life, by the oil that live, milk production. Milk from cows; they might have good water. Then it goes to all farms. It would also destroy crops.

The waste that comes back out is very corrosive and dangerous. They put the waste in Manmade holes and it will probably leak out. When they put all these chemical chemical gases in the ground, it eventually gets to very dangerous gas called fenson gas at the surface.
Dear [Name],

I hope this message finds you well. I wanted to check in and see how you are doing. It's been a long time since we last spoke.

I've been meaning to write to you for a while now, but life has been busy. I've been working on some new ideas and projects, and it's been challenging to stay focused.

If there's anything you need, please let me know. I'm always here to help.

Take care of yourself.

Sincerely,
March 2, 2011

Dear Honorable Karen Luey:

I believe that fracking can hurt people and other animals. In fact, it has been proven that fracking can hurt our planet too.

My first reason is fracking can hurt living things and maybe even kill living things. If you're not careful, the toxic gases go into lakes and rivers and pollute them. In addition, you can't wash in that water, can't cook with it, or give it to animals, and you can't drink with it either.

My second reason is the gas that we're fracking. Natural gas isn't a replacement for oil. Fracking has a lot of toxic gases in it. Baton gas is a gas that is underground and it might kill you. Baton can compile into the air and it can also pollute the sky.

My third reason is the facts of fracking. Fracking can be a very messy and also difficult job. If you're right, the fracking would get into your water too.

Thus, are my third reasons why I don't want fracking in Nova Scotia. I hope you liked my letter.

Sincerely,
Dear Honorable [Name],

I believe gardening is very good for our environment. Gardening is just one of the ways we need to help other people.

Gardening can be a source of entertainment and can also be used to clean the environment. Without proper gardening, we will not be able to maintain a healthy environment. The chemicals in the soil and water can contaminate our food and water supply. We should also focus on the benefits of the vegetables. By planting vegetables, we can provide food and ensure a healthy diet.

If we do not take care of the environment, it will cause unnecessary problems and could lead to the death of plants.

If the land plants cannot grow, the soil will become unsustainable and could lead to the death of all plants.

And the land plants cannot survive in the soil without water and chemicals. Which means if the chemicals get into the groundwater, plants on the farm will die.

In conclusion, if we continue to misuse our environment, we will not have a good future in our community. Please do not let this happen here.

Sincerely,
Dear honorable Karen Casey

I think you should stop fracking because there is nothing good about fracking.

Fracking is bad when the water supply is polluted and the cows drink the water with the chemicals in it. Milk will be injected with the chemicals. The farmers would go out of business and lose their farm.

If drinking water becomes contaminated, lots of people will get sick and could die from the affected water supply because of fracking.

Because of fracking, the plants die in the fields, and the trees will eventually die because the water they need will be polluted when it is pumped to the surface.

I hope you will agree with me and stop fracking.

Sincerely,
Dear [Name],

I believe that being near the ocean may not be safe and one should be cautious of the fact that we may not be as healthy as we think.

The city natural gas crisis can see much pollution and costs much to repair. We must not forget about the destruction of land.

But make sure it's done right and bid farewell with us.

Sincerely,
Each honorable Senator Cotney,
I believe that we should not have
foaming because it is dangerous to
our Democracy.
We cannot take the chance that
we will live with some water that
will not be able to clean up both
in the or other good marine mores.
This also a big waste of what
very few gallons of water per can.
If man is and because of having
can not be able to handle water
and if they do that our will be
full of toxic chemicals.
If we destroy our landscape
and nature will want to move
to our country and is why you
should keep thinking.

Certainly.
Dear Delaware Valley Day,

I believe that fracking is hazardous to our community and future. Please do not allow our financial leaders to even consider.

Looking is bad because you can't drink the water after fracking. You can't get all the work of mining or you cant cook with the water.

Looking causes cancer. Look contaminates soil for years, destroying the biodiversity. Air pollution, carbon, and a clean fuel source.

Sincerely:
Dear Honorable Mayor Reed:

Stop Fracking

I believe fracking is dangerous to our entire community. Fracking puts people's lives at risk.

Drinking is also a waste of water and gas. Everywhere people drink, they send water down fifteen times. There are about three thousand, two hundred thousand bushels of water, two thousand, five thousand and fifty-five bushels of water, as in some from springs and lakes. This one thousand gallons of water. This also leaves your tap on for six months.

Fracking is also bad for farmers because it could destroy the landscapes and make farmers run out of money. If the cows can't drink water, they can't produce milk and if they can't produce milk, the farmers can't make money.

All fracking is doing is killing the earth. And the earth once your water is heated, you can't get it back. And so unless we will heal the earth, what hope will your children have?
Dear Father John,

I believe that Frogsheat is very close to the North Pole. Consequently, the trees growing there are quite short, and may even have moss or lichen. Because of this, we will see many kinds of birds and animals in the area, as well as some of the smaller insects. In fact, the animals and birds may be different from those we see here.

The possibility of our journey is very exciting. It is always important to be prepared for anything, but we can enjoy our journey and many things.

There are several ways that we can help our friends with their problems. I want to help children, families, and our world. I am happy to share my worries about our journey, but we can worry about both animals and wildlife, since they would be affected by this.

Thank you for reading my letter.

Sincerely,
Dear Monongahela Baron council,

I think fracking is bad for our community and our planned. Fracking contaminated our water resource and it destroys the landscape. When my watched program about fracking all of people did not have good opinion with fracking.

People have lost their water or fire. Also people water has turned green and indescribable because of fracking. People had to move away to other towns to do. And fracking job it takes too much loads of clean water to make that water is like a open supply of it even used water.

So this is why I think fracking is bad. Let's work fracking on the North shore or anywhere in the world.

Sincerely,
June 3rd

Dear [Recipient's Name]

I believe that planting a garden in our community and the presence of flowers and everyone should have their doors open on this street.

With planting, it is very easy to get the community involved and have people come and have their lives changed. As an owner, you can also take pride in watching others be able to grow, watch them, and learn with them.

Having a garden that has the community involved in the forefront. Students can not only learn to grow but also take care of the living beings. Everyone can come from watching, and you can control problems.

With planting and watching, you can see if there are issues or just the general growth. Growing and having your own produces a sense of pride and satisfaction. Sometimes, people will become very involved in the garden, but it is good to see the people who are involved.

Sincerely,
I believe we should stop fracking because it is dangerous, and people don't want their water contaminated.

Why people don't want fracking is that their water gets contaminated with gas, so when they live there, the water is sour and it has chemicals that are toxic.

The water with these chemicals in it gets in to even wells, the water they use for pressure to go the gas, so they wash them off. After they make a pit in their well, and put a rubber pad in it, then dump the salt water in the pit and have it.

The water they use for pressure for your home, where they get it from the land and sand. They boil water, it keeps all day, and they use the water then put it in a tank to hold the bore water. That's a waste.

I hope now you know that fracking is something we need to stop. So people don't get and drink their water contaminated, and the kids. They make sacrifices and need so much water water.
Dear Governor:

I believe fracking is dangerous for my community and the people living near the fracking site. It could harm both human health and the environment.

All it takes is one leak to cause a problem. Fracking affects us all, and it can possibly kill living things.

Fracking is supposed to make us rich, but it is made of toxic chemicals and water. People should be living here and not worrying about their health.

Once a gas leak occurs, it is hard to fix unless you catch it early.

So please help stop people fracking today.
To the Honorable Judge Court:

I believe we should stop farming because it is making the earth sick. The powder and chemicals kill the earth. This is because there are many extremely dangerous chemicals that we put there.

Another reason we should stop it is because it is bad for the earth. Most people think that because they use some chemicals that are dangerous, it is an effective way.

This makes the earth not look right. I see the amount of soil and a lot of water. The soil and water that are used to make the Earth look all the good colors it needs.

My third reason is that it makes mankind. The weather has been so that when we eat the dust and coal from the Earth it will not be good. Some people say that they don't eat it but in the dust. So what will we look like in 10 years or 20 years?

So I urge you to go with my point of view.

Sincerely,
June 13, 2011

Dear Franskie and Cathy,

I believe that fishing is both fun and productive at the same time.

Fishing can affect our environment. In the long term, if we do not take care of our waters, it will harm our waters. Tides affect our waters, and so do activities.

When you are fishing, you are using our public lands. You do not own them, but we do. If you do not take care of our fresh water sources, when the water comes back, it's yours and it's full of chemicals, and it's not good for anyone anymore.

If we did not take the risk to use technology, then you know if you could get at like...

I just thought you should know what fishing can do to our lands.

Love,
Dear Karen Casey,

I did not want to have fracking in the town of All of the people of would like to have all of our water in showers and in drank.

Some scientists think that fracking causes earthquakes, happened so they stopped the fracking.

In my opinion fracking is bad for our water and our environment, so please stop the fracking. We do not want to have this in our neighbor hood.

Sincerely,
Dear [Name],

I hope this letter finds you well and in good health. I am writing to express my gratitude and concern for your well-being.

I read with great interest your latest work on the topic of [specific topic]. Your insights and research are truly refreshing and I believe they will contribute significantly to our understanding of [related field].

I am particularly impressed by your dedication to [specific aspect of your work]. Your passion and commitment are truly inspiring.

I would like to express my support and encouragement for your continued efforts in [specific area]. Your contributions are invaluable and I am confident that they will continue to make a significant impact.

Please let me know if there is any way I can assist you in your work. I am always here to offer support and guidance.

Thank you for your continued dedication to [related field].

Yours sincerely,

[Your Name]
Dear Honorable Senator Casey,

I believe we should not do fracking in my community. I think it's dangerous to our health. Also, it can contaminate our water so we can't drink it, give it to pets to drink, shower, wash dishes, and clothes, and many other things. It also would be bad for our farming industry and dairy industry.

Fracking would also affect our environment in the following ways: they would have to put these chemicals in the air and water. The chemicals would go into the air and water, then into the water that they use to flush and the natural gas gets put in a good like lake. Then they leave it there hoping that it will evaporate into the air. Some of the water does that, when it rains the ground swallow it and runs over the edges. It spills into wetlands causing everything in it to die, including
Always working hard to improve
the minds of the young as
we aspired to educate our
children. We will be
continuing our
endeavors and promote the
spiritual growth of our
children at every aspect of
life and encourage the
conceptual

Your work is highly valued. You should
not be allowed to do this huge.

[Signature]
Dear variable Earth Group:

I think that fracking should not be done because we need water to drink. Fracking uses very dangerous chemicals, and you might get sick with some of the unused chemicals in it.

Put water some times it will run down the side of the hill; but it doesn't look like something you would want to drink.

If you frack, it can cause you a lot of problems for you and your family. But if you take a drink of your water and people around you drink your water, will never trust the same again. And your water is not worth fracking.

The water they use just evaporate. Do you know where they get it? They get it from their lakes and rivers. They sell a lot of water for 24 hours a day. They pull the water into a pond to hold the toxic.

Fracking should stop now. All it is doing is making our water up.
and if it is not good for us then it is not good for our home towns or our province.

By
From: Wayne Edgar
To: <frac-review@gov.ns.ca>
CC: <karencasey@ns.aliantzinc.ca>
Date: 6/6/2011 1:19 PM
Subject: Scope of Review - Submission

Dear Minister Parker, Minister Belliveau, Premier Dexter and Departmental Officials:

Thank you for the opportunity to comment on the draft terms of reference for the Review of Hydraulic Fracturing for Shale Gas in Nova Scotia. In addition to the areas listed in the draft scope document, I offer the following comments:

- I am dismayed to see that there is no reference or provision in the terms of reference (TOR's) for public participation in the review process. As you all know there is a great deal of concern among citizens about hydraulic fracturing. Simply handling the review process over to a closed group and process, no matter how qualified the individuals may be, risks the credibility of the entire process and robs the effort of the accumulated experience of the many Nova Scotians who have spent a great deal of time and effort educating themselves about hydraulic fracturing. The voice of citizens - both pro and con - needs to be heard and heard publicly. I urge you to include in the review process the encouragement of submissions from the public and public hearings to provide a forum for the rich experience of many groups and individuals. This is an opportunity for all of us to grow in knowledge and perspective.

- I note that the TOR's refer to shale gas exclusively. Not being a geologist I am not sure if natural gas is present in other formations such as sandstone and coal which also exist in Nova Scotia. If indeed gas is present in other geological formations and the possibility exists that these formations may also be hydraulically "fracked", I hope the review process will also consider the environmental risks of this eventuality. The focus should be on the fracking process in Nova Scotia's unique environment not just shale fracturing.

- As I understand it, the geology of Nova Scotia is a particularly challenging environment to drill in and especially risky if hydraulic fracturing technologies are used. Geological formations under Nova Scotia are generally angled and rarely horizontal. This creates greater risk for seepage and for fluids to travel thus polluting water sources. I hope the review will assess the specific risks of using fracturing approaches in our particular geological circumstances. Perhaps existing industry best practices won't be good enough in our environment.

- I also note that there is no reference to the impact of significantly increased truck and other heavy equipment traffic on the highway infrastructure of our province. Neither is there any mention of possible conflicts with other established industries such as tourism. Obviously the decision to establish a new and potentially high impact industry needs to include an assessment of its affects on the existing social and economic fabric of the communities in which it will be located. The proposed review needs to include these considerations as well as the environmental impacts.
- Finally I am left to wonder if the development of shale gas in Nova Scotia will be worth it when all the positives and negatives of the many factors involved are taken into consideration. Do we really need more natural gas? How much additional carbon is produced in the process of extracting and using the gas in our oil and gas dependent economies? When a rigorous cost-benefit analysis of more gas development is done what is the bottom line for the future of our planet? Does not our environment and the air we and all other creatures and plants breathe trump all other factors? I am heartened to see the aggressive alternate energy policies adopted by our provincial government but this one feels like it could be a step backward to me. I encourage the review panel to also consider the impact of gas development in this broadest of contexts.

I would appreciate confirmation that this email message has been received.

Thank you for your attention to this letter.

Sincerely,

Wayne L. Edgar
From: Ben Trueman
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 1:58 PM
Subject: comments on Draft Scope Document

To the staff of the Nova Scotia departments of Environment and Energy:

I would like to submit the following comments in response to the Draft Scope document available on the NS Dept. of Environment website.

First, large quantities of freshwater are contaminated in the process of hydraulic fracturing; University of Toronto professor Ben Parfitt, in an article titled “Fracture Lines”, estimates that over 900,000 cubic meters of water are required in order to drill just ten wells. Of course, much of this water stays underground, contaminated with a slew of known toxic or carcinogenic chemicals. The long term effects of these chemicals on groundwater are poorly understood, but the practice of hydraulic fracturing has been associated with significant negative impacts on water quality and quantity in other parts of North America, including New Brunswick. While the Department of Environment claims that wells drilled in the province would not impact groundwater, what guarantee is there given the relatively poor understanding we have of hydrogeology and of the proprietary chemicals employed?

Furthermore, the fluid that is pumped back to the surface is severely contaminated. There are serious safety concerns associated with the storage and transport of “produced” water, not to mention the fact that Nova Scotia lacks a facility capable of treating and disposing of this toxic waste. In addition to potential effects on water, clear cutting of forests will be required for the construction of well sites, roads, and tailings storage facilities; I believe that this sort of environmental damage should be included within the scope of the review.

Sincerely,
Benjamin Trueman
From: <frac-review@gov.ns.ca>
To: "Premier Dexter" <premier@gov.ns.ca>, "Jim Morton" <jimmorton@kingsnorth...
CC: 
Date: 6/8/2011 2:50 PM
Subject: written submission

Attention: Frac Review Committee
Nova Scotia Department of Environment

I am writing to express my concerns about fracturing for shale gas in Nova Scotia. Much has been written of late about this method of satisfying our growing needs for energy which has moved me to respond to the Government's request for for citizen input. I am an ordinary citizen living in the Annapolis Valley who has read many press releases emanating from the negative impacts this has had in some parts of the United States and Great Britain and do wonder why we would even consider opening the door to this, however limited the potential for harm might be. While I understand that there are potential economic gains to be made - a limited amount by local communities through employment possibilities, a lot by the energy companies involved in the shale gas production and very little by the Province as a whole after taking into account the initial two year royalty free offering - I believe this should not be used as 'a carrot on a stick' to entice Nova Scotians into thinking there will gains without loss. As the population on the planet increases (2 billion when I was born, 67 years ago, and now nearing 7 billion) I think we need to operate from a very different mind set regarding all our resources - priority being given to those essential to human health and survival i.e. WATER AND SOIL. Deep well drilling, pouring millions of gallons of water laced with a soup of chemical additives and extracting only a portion of this toxic mix to be trucked and dumped where?? to satisfy our (human) addiction to fossil fuels does not bode well for future generations seeking to live in Nova Scotia. Regulating the industry is a questionable solution.

It is my sincere hope that this Government will follow the examples of others eg. France, Quebec and call for a moratorium on all shale gas drilling. It is time for courage - courage to embark on serious promotion for the development of sustainable energy such as wind and solar AND to launch a campaign to educate all Nova Scotians about the essential need to reduce our energy consumption. Addictions are a challenge to overcome but it can be done!

Thank you for the opportunity express my opinion on this important matter.

Sincerely,

Linda O'Neill
From: Ann Manicom
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 2:55 PM
Subject: Submission to June deadline for public comments on the Scope
Attachments: Scope Letter docx

Please see the attached submission commenting on the scope for the Hydraulic Fracturing Review.

Sincerely

Ann Manicom, PhD.
From: <frac-review@gov.ns.ca>
To: 
Date: 6/6/2011 2:56 PM
Subject: Hydraulic Fracturing

Hydraulic Fracturing June 6, 2011

I am very concerned about the many unknown and long term effects that can result from the hydraulic fracturing, or fracking, process. I am particularly disturbed that there does not seem to be any consideration about whether it should perhaps not be considered at all. Everything I read from the government seems to say that the commitment has already been made to go ahead with this type of mining no matter what! Just trying to figure out which are the best methods to reduce harm is not good enough!

It has always been my belief that the health and safety of people, their communities and the environment come first for a NDP government. Responsible economics comes next, after there is a long-standing proven track record of safety.

Any new industrial process should be more thoroughly investigated for all the impacts, both short and long term, and extensive public consultation should be involved before any steps are taken to allow the fracking industry to be introduced into the province.

Thank you for inviting comments,

Sincerely,

Marion Webb
Hello,

Please find attached a PDF version of the submission from OTANS on the scope of the Hydraulic Fracturing Review Study. If you have any difficulties opening the attachment, please let us know. In addition, a reply e-mail at your convenience confirming your receipt of our submission is appreciated.

Kindest regards -

Barbara B. Pike
Executive Director
OTANS - the energy association
202 Brownlow Avenue, Suite 305
Cambridge Tower 1
Dartmouth, NS B3B 1T5
902-496-3182 - P 902-452-1172 - C
www.OTANS.com
OTANS - THE ENERGY ASSOCIATION


Submission to the
Hydraulic Fracturing Study

06 June 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
P.O. Box 442
Halifax, N.S. B3J 2P8
OTANS – the energy association

OTANS is the not-for-profit industry organization for Eastern Canada’s energy industry. Since its inception in 1982, the membership of OTANS has swelled from a dozen to over 300 member businesses throughout Atlantic Canada.

The mandate of OTANS has always been to support the maximization of Atlantic Canadian participation in the supply of both goods and services to meet the needs of the energy industry. Its purpose is to identify, promote and support the development of opportunities in hydrocarbon and associated industries.

For most of its 30 years, OTANS has specifically represented the supply and service industry for the oil and gas sector in Atlantic Canada. However, as the energy industry evolves so too has our association to embrace the complete offshore and onshore energy spectrum including oil & gas, wind, tidal, wave, biomass and geothermal. A small number of our members are energy producers, but most are businesses that provide goods and services to the industry, and in so doing employ thousands of Atlantic Canadians and contribute tens of millions to the local economy.

Overview

The Nova Scotia government is undertaking a comprehensive technical and policy review of hydraulic fracturing that examines the environmental impacts of the technique, while identifying how such issues are managed in other jurisdictions.

As indicated in the announcement, the review is focused primarily on issues about water, and the proposed scope will examine the following potential environmental issues:

- effects on groundwater;
- use and effects on surface water;
- impacts on land, such as potential soil contamination;
- waste management, including surface ponds of produced waters;
- identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids;
- site restoration; and
- financial security/insurance that operators are required to provide prior to conducting activity in the province.

Our association supports regular review of the regulatory regime covering the energy sector. Regulations need to evolve to reflect best practices and the latest technology of the industry. We applaud the provincial government for the current review as interest in onshore oil and gas increases and there is a real potential for the production of oil or natural gas from shale formations.

The technological advances in the industry of the last few years have dramatically increased the estimates of recoverable reserves of natural gas throughout North America. Advances in hydraulic fracturing technology may well be the reason, but fracturing wells is not a new technique. It has been used in the oil and gas industry for about 60 years, and even longer in the drilling of water wells.
In tandem with the increased estimates of recoverable reserves, there is an increased demand on limited capital for exploration, and without exploration there is no development. Energy companies look at competitive and stable regulatory regimes when making a decision on which potential play to invest.

Effective regulations need to balance the need to protect the environment and public health and safety, while allowing economic development and conserving resources. It is a balancing act that Nova Scotia has experience with through its offshore oil and gas regulatory regime.

While onshore oil and gas is relatively new to the province, the sector is robust in other jurisdictions in the county, specifically in Western Canada. British Columbia and Alberta have stable and predictable regulatory regimes that reflect the balance needed to encourage investment and development while protecting the public interest. It is that balance we encourage this review to emulate.

**Developing Nova Scotia’s onshore oil and gas potential**

While ‘shale gas’ is revolutionizing the energy sector, it has unfortunately also garnered a lot of negative publicity. Hydraulic fracturing has become a divisive public policy issue with misinformation and fear spread through the Hollywood movie *Gasland*. Even though much of the claims made by the movie have been dismissed by independent reviewers, the errors are repeated as fact by many opposed to oil and gas development.

Industrial development does have an impact whether it is social or environmental. However, good regulations mitigate the impact and potential risks. In other jurisdictions, there have been thousands of natural gas wells drilled in shale formations with the use of hydraulic fracturing to stimulate the reservoir with very few incidents. It is attention to wellbore construction that mitigates the risk of such incidents.

Technological advances driven by concerns about waste water disposal have produced better treatment and new recycling methods at production sites. More coordinated and cooperative approaches by energy companies have reduced the environmental footprint of projects.

Much has been written about the ‘secret’ additives that are used in the hydraulic fracturing fluids. Other jurisdictions are now requiring full disclosure of those additives, most of which are common materials found in most homes, and actually make up less than one percent of the volume. Other materials, such as propane, are also used in many fracturing operations.

A good, robust regulatory regime mitigates potential risk and provides the balance of allowing development while protecting the public interest.

**Benefiting from Nova Scotia’s onshore oil and gas potential**

There is also the potential for significant environmental benefits from producing natural gas here in Nova Scotia. With roughly 75% of the province’s electricity generated by coal-fired plants, a supply of local natural gas provides the option of a move to a cleaner fuel source. While renewable energy projects in the future will help cut the province’s reliance on coal, natural gas provides an attractive ‘transition fuel’ to a cleaner future with fewer quantities of nitrogen.
oxides and carbon dioxide than burning coal or oil. With investment in infrastructure, Nova Scotia could eventually export cheap, clean natural gas electricity to other provinces or the United States who may rely currently on coal to produce power.

The benefits of hydraulic fracturing to the economy of Nova Scotia can be significant. The industry will provide a new demand for goods and services that can be provided in the province, as well as add jobs to the economy. Such new activity generates revenue for the provincial government through taxation and through royalties in the production phase.

When reviewing regulations, it is important to weigh the benefits that come from development. That is not to say development at any costs, but good regulation provides the balance. Protection of the environment is important, so too is the maximization of local economic benefits. Regulations and guidelines can reflect the expectation that the local supply chain is engaged and informed of procurement opportunities.

Investing in Nova Scotia's onshore oil and gas potential

Your review should also learn from the existing regulatory regime for Nova Scotia's offshore petroleum industry. Yes regulation is necessary, but it should not be so onerous as to prohibit development. Site specific drilling plans, environmental assessments, daily reporting are all needed. But so too is a one stop timely approval process so that operators and the general public have a single focus for regulatory review of applications.

That means investing in a regulatory framework that includes the officers need to review applications in a timely and efficient manner.

In closing

Onshore oil and natural gas development can be a game changer for our province. There are significant environmental and economic benefits. A stable, robust and timely regulatory regime is essential to ensure environmental risks are mitigated and the public interest is protected.

Any industrial activity has a social and environmental impact, onshore petroleum is no different. While this may be a relatively new activity for Nova Scotia, the industry has been successfully and safely developed in other jurisdictions, specifically in Western Canada. Thousands of wells have been successfully brought to production by hydraulic fracturing with few incidents. Reviews of these incidents show not a failure of the regulatory regime, but a failure to properly adhere to existing regulations and best practices.

While your scope primarily focuses on issues about water, this is an opportunity to ensure that the complete regulatory framework mitigates risk to the environment and public health and safety.

However, it is also an opportunity to ensure there is a full and fair opportunity for the local supply chain to participate and benefit throughout the exploration and production phases of this industry. While this review concentrates on environmental issues, we suggest it also review how moving forward, local benefits are maximized to take advantage of the opportunities and potential provided by the onshore energy sector.
From: Nick Langley <nick.langley@ns.cancer.ca>
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 6/6/2011 3:49 PM
Subject: Hydraulic Fracturing submission - Canadian Cancer Society
Attachments: Fracking submission_FINAL_MS.docx

Please accept the following attachment as the formal submission from the Canadian Cancer Society - Nova Scotia Division for the Hydraulic Fracturing review conducted by the Departments of Environment and Energy.

Respectfully submitted,

Nick Langley
Public Issues Manager
Canadian Cancer Society - Nova Scotia Division
5826 South St. Halifax, NS B3H 1S6

Tel: (902) 423-6183
Toll Free: 1-800-639-0222
Fax: (902) 429-6563
Email: nick.langley@ns.cancer.ca
www.cancer.ca/novascotia

April is the month to fight back.
The Canadian Cancer Society in Nova Scotia is concerned about continuing the practice of Hydraulic Fracturing without proper disclosure of the potential risks to the community. There are four elements in particular that the community has a right to know about:

1. The chemicals that are being injected into the natural gas wells
2. The recovery rate of these chemicals
3. The monitoring of arsenic and other natural contaminants into the water table, and
4. The monitoring of indoor radon levels in residential areas.

Currently, the health risks for communities close to Hydraulic Fracturing are unclear. It is our understanding that the chemicals being used vary from location to location. Each well requires a different chemical mixture based upon the geologic rock formations, which are unique to each drilling site. For instance, drilling chemical compositions are different in Hants County compared to Inverness County based upon the rock formations. Currently, there is no public disclosure of what chemical composition is used in each well by companies operating in Nova Scotia.

Data from drilling sites in the United States has shown that the mixture of chemicals being used can contain a number of known carcinogens. The New York Times released a draft report from the American Environment Protection Agency stating that an early draft of the study discussed potentially dangerous levels of contamination in hydrofracking fluids and mentioned ‘possible evidence’ of contamination of an aquifer.\(^1\) It has also been found from drilling sites in the United States that the recovery rate of these chemicals can range from 10-90%. Without public disclosure of the types of chemicals used and their recovery rate, there is no way to evaluate if there are potential health risks.

There are companies that have moved towards greater transparency. In the United States, Halliburton offers a disclosure on its website of the chemicals used in its compositions for each drilling site. In Nova Scotia, it would probably be more appropriate if well information was displayed by a government body, such as an interactive map on the Department of

\(^1\) http://www.nytimes.com/2011/03/04/us/04gas.html?_r=3&hp
Environment's website. This would provide transparency and allow residents the information to make informed decisions about what is occurring in their communities as it affects them.

Geologists state that Nova Scotia's rock formations offer different complications for companies performing hydraulic fracturing in our province. Arsenic is a naturally occurring metallic element found in rock formations throughout the province that can naturally find its way into drinking water. Arsenic is a known carcinogen. There are many Nova Scotians who are at risk of being exposed to higher arsenic in their well water. Health Canada states arsenic levels in drinking water should not exceed 10 micrograms per litre, yet tests have shown that some Nova Scotia wells contain 70 times that amount. Forty-five percent of Nova Scotians receive their drinking water from wells and a review of appendix 1 shows the areas where arsenic levels are higher.

Nova Scotians have one of the highest overall incidence rates of cancer in the country—including among the highest rates of bladder and kidney cancer. In 2011, Nova Scotia will have an estimated 275 new cases of bladder cancer and 220 new cases of kidney cancer, as researchers are working to see if these types of cancer are attributed to arsenic in our drinking water. The Canadian Cancer Society is funding research lead by Dr. Louise Parker, Dalhousie University, that is exploring the relationship between arsenic in well water and kidney cancer rates in our province. It is not known if the disruption of the rock from Hydraulic Fracturing would increase the amount of arsenic exposure in well water. It is important to ensure that water is continually monitored for increases of arsenic and any other naturally occurring contaminants.

Nova Scotia has another unique issue based upon its geology, which is radon gas. Radon is a radioactive gas that is formed when uranium breaks down naturally and escapes from the soil, rock, or water into the air. In Nova Scotia, radon is found where there is bedrock that contains uranium (refer to appendix 2). The process of hydraulic fracturing has the potential to release more radon gas into ground water and into people's homes. When it is built up in contained areas such as basements in homes, radon gas is known to cause lung cancer. Experts agree that about ten percent of lung cancer deaths in Canada are related to being exposed to radon in the home. Radon exposure is the leading cause of lung cancer in non-smokers and it's estimated that in Canada there are about 2000 lung cancer deaths related to

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3 Atlantic Path (http://atlanticpath.ca/arsenic/summary.html)
radon each year.⁵ Lung cancer is a disease with a very high mortality rate. In Nova Scotia this year, out of the total 6100 estimated new cases of cancer 910 will be lung cancer, and there will be an estimated 450 lung cancer deaths.⁶ The Canadian Cancer Society strongly urges the Nova Scotia government to monitor the effect of Hydraulic Fracturing on residential indoor radon levels.

There are many factors that the Canadian Cancer Society would like addressed on the issue of hydraulic fracturing before this procedure is approved in Nova Scotia. According to the Nova Scotia Department of Energy, one percent of the solution that is injected into hydraulically fractured wells is made up of the chemical composition. However, when one considers the vast volumes of material injected into the wells the actual volume of chemicals is potentially hazardous to human health. Given Nova Scotia’s geology, it will be important to monitor the effects of Hydraulic Fracturing on arsenic and radon gas exposure, and ultimately cancer rates. These questions must be addressed and until that time we would suggest that the Government of Nova Scotia be prudent to evoke a moratorium on hydraulic fracturing in Nova Scotia.

1. Nova Scotia Department of the Environment (www.gov.ns.ca/nse)

Test Your Well Water for Naturally Occurring Arsenic

Areas vary likely to have arsenic in well water. These areas have
geological features known to contain arsenic-bearing deposits.
Well water frequendy exceeds national drinking-water guidelines for arsenic.

Areas that may have arsenic in well water. Water in these areas
have none or low reported occurrences of arsenic that generally do not
exceed national drinking-water guidelines, but testing and treatment, if needed, are not recommended.

This map is based on data available as of April 2005.

2. Nova Scotia Department of Natural Resources (www.gov.ns.ca/natr)


Map Showing Potential for Radon in Homes in Nova Scotia
Draft December 2008

Potential to Exceed Health Canada Guidance for Radon in Air

Level 1: High potential. Based on the average presence of radon and common presence of 0.9 pCi/L or greater, as measured at least once in a radon-susceptible home or in a home that has undergone a radon mitigation system that has been in place for at least 1 year.

Level 2: Moderate potential. Contains either known high radon concentrations in common settings or a combination of low concentrations in common settings.

Level 3: Low potential. Areas of low indoor radon levels, with or without a common setting. Radon is unlikely to exceed the Health Canada guideline for radon in air.
From: matthew smith
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 3:54 PM
Subject: Hydraulic Fracturing Study

Hydraulic Fracturing Study
Environmental Science and Program Management
Division
Nova Scotia
Environment
PO Box 442
Halifax NS
B3J 2P8

Please take any Hydraulic Fracturing endeavors in the Province of Nova Scotia seriously. Our ground water is too valuable to experiment with. Too many people and ecosystems depend on a clean, reliable and safe groundwater resource to have a fracturing incident destroy and contaminate it.

I have a couple of questions for you. How does one restore the ecological integrity of an area exposed to fracturing? Before fracturing is undertaken, is there enough monitoring capacity by a representative of the groundwater shareholders (citizens) or is monitoring and data being managed by consultants paid by the proponent?

I would suggest a ban on Hydraulic Fracturing in Nova Scotia before a catastrophe occurs.

Sincerely,

Matthew Smith
From: Laura Nauta  
To: <frac-review@gov.ns.ca>  
Date: 6/6/2011 3:55 PM  
Subject: Public submissions for hydraulic fracturing  
Attachments: ShaleGasDrilling_Report_6JUN11.docx

Good afternoon,
I have attached a report for public submissions for hydraulic fracturing.
Thank-you,
Laura
Shale Gas Drilling Constituent Health and Cancer Risks

Laura Nauta, B.Sc. GIS Analyst and Research Assistant, Dr. Trevor Dummer, Research Director, Dr. Louise Parker, Director, Population Cancer Research Program, Dalhousie University and Canadian Cancer Society (Nova Scotia Division) Chair in Population Cancer Research, May 2011.

Introduction

Shale gas drilling, a hydraulic fracturing process or fracking, is the process in which gas is extracted from shale rock for energy purposes. The process can cause breakdown of existing compounds in the soil and underlying geology and also introduce new chemicals to the surrounding natural environment, including the groundwater and air, ultimately causing health concerns for individuals living and working in the area. Though the actual hydraulic fracturing occurs one to two kilometres below the surface, the development of the project, from initial drilling stages to completion and exhaustion of the well, is associated with use and production of chemicals and compounds.

One concern with fracking is the possibility of releasing arsenic and other naturally occurring elements into groundwater sources. Long-term arsenic exposure from drinking water poses a health risk for bladder and other urinary tract cancers. The geology in Nova Scotia contains arsenic sources which leach into groundwater causing relatively high levels historically and through to the present. The introduction of fracking wells could potentially increase the levels of arsenic in unregulated private well drinking water sources to levels high enough to impact health. However, there is a paucity of research evaluating the role that fracking may play in the release of naturally occurring contaminants into the environment.

Adverse effects on health and increased cancer risk from chemicals associated with the fracking process are the main concern within this brief report. There are hundreds of chemicals available for use in the fracking process, though not all would necessarily be used in Nova Scotia for specific site needs for each well drilled.
Construction and Process of Hydraulic Fracturing

The drilling process, as an interactive demonstration from the Halliburton website demonstrated, is relatively short until the well is established. Beyond this the well remains for a few decades to exhaust the natural gas resource from the site. First a drill rig is temporarily constructed to begin drilling. A conductor casing, a steel pipe cemented into place, is lowered for the initial drilling stages to protect against the escape of hydrocarbons. This is followed by the surface casing, another longer steel pipe, to protect groundwater sources between 100 and 800 feet. The drilling continues to the target shale formation where the path begins to turn horizontally at the kickoff point establishing the horizontal section to the toe and the heel of the well. The hydraulic fracturing takes place between the toe and the heel at the end of the horizontal shaft. The steel pipe lined path is encased by cement and perforating begins. A series of holes are drilled through the pipe and cement to create the flow path for the hydrocarbons. The drilling equipment is removed and a well head is put in its place along with water resources.

The fracturing process begins after the well is completed. There are typically 10 to 100 stages, separated by mechanical plugs, to initiate the fracturing process of extracting gas from the shale rock formation. Water is used to prop open the fracture and transport the sand which ensures open access to the resource. The plugs are removed after the fracturing process and the hydrocarbons are then free to flow through the wellbore to the surface.

Geology

The chemical composition of shale is primarily quartz and carbonate of about 52% at the Nova Scotia test sites, or the Horton geological group. There is also a content of about 42% clays as found by the test samples. This does not indicate arsenic presence at the target extraction area.
However, the drilling must pass through and disturb many layers of rock to get to the site at approximately 1200 feet, as determined by two test wells in Kennecott.

Chemicals

With the help of an article in press by Colborn et al., Natural Gas Operations from a Public Health Perspective, hundreds of chemicals were identified to be associated with the process of fracking, from project start to completion\(^5\). From this list, 84 chemicals were selected, researched and compiled into a list specific to possible cancer risk\(^1\), see Table 1. Chemicals released to the press from Haliburton, an oil company involved in shale gas drilling, were also included in this table where there was evidence or speculation of cancer risk\(^1\). Table 1 (see appendix) summarises the known health risks associated with exposure to these chemicals, either for human exposure or in animal models. It should be noted that these studies do not relate to releases of these specific chemicals related to the fracking process, as these studies do not currently exist, rather they relate to what is currently known in relation to general exposure to these elements.

Conclusion

Though evidence is limited for many of the chemicals researched, there is an overall concern around the potential for increased cancer risk with exposure for many of the chemicals listed in Table 1. Many rodent studies provide evidence of increased cancer incidence with exposure to the listed chemicals although there is currently limited research based on human populations and exposure. Furthermore, it is difficult to estimate the level of risk of exposure to these chemical because there is only limited data available concerning the amounts of the
chemicals released through the fracking process. Due to limitations of existing data and the evidence for potential health effects associated with many of these chemicals there is a strong need for further research, especially related to cancer and other health risks associated with the fracking process.

The Atlantic Partnership for Tomorrow’s Health Project (funded by the Canadian Partnership Against Cancer) is supported by the government of Nova Scotia, and is a major initiative dedicated to health research in Nova Scotia. The project is currently investigating water quality and associated health risks, with emphasis on arsenic exposure and bladder cancer. Some of the highest rates of cancer in Canada, including bladder and kidney cancer, are found in Nova Scotia. Nova Scotians may be at risk from an increase of groundwater chemical exposure that may be associated with fracking. It is essential that all due diligence be taken initially and that all precautions are undertaken in eliminating risk of chemical contamination of water.

References


20. Office of Environmental Health Hazard Assessment. OEHHA Proposition 65 - Notice of Intent to List Bromochloroacetic Acid and Cumene. 2010. Available at:


## Appendix

Table 1 - Table included from Colborn et al. 2011 paper to press for September 2011, for chemicals with probable positive associations with cancer from the shale gas drilling process. New information has been added to the evidence for cancer and health effects columns. There is a need for further research on items identified “un/a” in cancer evidence. However, time constraints have limited a full and thorough research of each chemical.

<table>
<thead>
<tr>
<th>Chemical</th>
<th># of Products</th>
<th>Product</th>
<th>Purpose</th>
<th>CAS #</th>
<th>(Group/Animal/Cellular)</th>
<th>Health Evidence</th>
<th>Possible Health Effects</th>
<th>Health Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,4-Butane</td>
<td>1</td>
<td>CRW9152A Corrosion inhibitor</td>
<td>Corrosion inhibitor</td>
<td>123-91-1</td>
<td></td>
<td>-A study on workers with the chemical did not differ between number of observed cases and expected deaths from cancer</td>
<td>-Carcinomas and adenomas observed in rate from National Cancer Institute study</td>
<td>-Probable human carcinogen determined by EPA</td>
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<tr>
<td>(Thiocyanoethyl) benzothiazene (TCMDB)</td>
<td>3</td>
<td>Butan 1009, MEELT 5, Butan 1036</td>
<td>Biocide, fracturing, unknown</td>
<td>21564-17-0</td>
<td></td>
<td>-FPA determined as “Group C – Possible Human Carcinogen”, based on significant increases in rat testicular interstitial cell adenomas and thyroid adenomas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2,2'-Naphthol</td>
<td>3</td>
<td>318 Liquid Breaker Aid, XL-W-14, Baktron K-87</td>
<td>Liquid breaker aid, fracturing</td>
<td>102-71-6</td>
<td></td>
<td>-A study of chemical plant workers producing acetic acid and acetic anhydride observed excess mortality from biliary tract and prostate cancers which were difficult to interpret biologically</td>
<td></td>
<td></td>
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<tr>
<td>Acetic anhydride</td>
<td>2</td>
<td>CUI/A, Acetic Anhydride</td>
<td>Additive, fracturing, unknown</td>
<td>108-24-7</td>
<td></td>
<td>-DNA damage and inhibition of DNA repair as acrolein contributes to lung carcinogenesis</td>
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<tr>
<td>Acrolein</td>
<td>1</td>
<td>Biocides-Acrolein</td>
<td>Biocide, fracturing</td>
<td>107-02-8</td>
<td></td>
<td></td>
<td>-Highly soluble in water and may cause cancer and genetic damage</td>
<td>-A classical carcinogen &quot;Group 2A – probably</td>
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<tr>
<td>Acrylamide (2-Propenamide)</td>
<td>6</td>
<td>V-Tex/2, New PHPA, Acrylamide, Alcomere 609RD #2, Poly-Plus WPS Sticks</td>
<td>Shale control inhibitor, bentonite extender, unknown, fracturing, friction reducer, fluidant</td>
<td>79426-1</td>
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<tr>
<td>Compound</td>
<td>Description</td>
<td>Carcinogenicity</td>
<td>Notes</td>
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<td>Acrylate acid</td>
<td>2 Acrylate 60RD #2, WPS Sticks</td>
<td>Flocculant</td>
<td>80.10.7</td>
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<td></td>
<td></td>
<td></td>
<td>No solid evidence of carcinogenic effects for humans, squamous cell</td>
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<td></td>
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<td>carcinoma of the skin in mice.</td>
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<td>Aniline</td>
<td>1 ZetaFlow #2</td>
<td>Fracturing</td>
<td>65.57.3</td>
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<td></td>
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<td></td>
<td>- EPA carcinogen &quot;Group 2B - possible human carcinogen&quot;</td>
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<td>Atapulgite clay</td>
<td>5 Atapulgite, Dsco #2 &amp; #3, Salt Gel, Zetagel #2</td>
<td>Oil well treating compound, additive, gelatin, fracturing</td>
<td>12174-11-7</td>
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<td></td>
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<td></td>
<td>- IARC lists atapulgite clay as &quot;Group 2B - possibly carcinogenic to humans&quot;</td>
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<td>Bentonite</td>
<td>Aquagel, Aquagel Gold Seal #1, 2, Bentonite</td>
<td>Viscousfricellan</td>
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<td></td>
<td>#3, Basagel, Bentonite Gel, Bentonite Extender,</td>
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<td>- EPA classified &quot;Group 2 - probable human carcinogen&quot;</td>
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<td>Black Hills Gel, Flexplug W, Fresh Gel, Holeplug,</td>
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<td>- Exposure to mice increased incidence of tumors at multiple sites.</td>
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<td></td>
<td>Haliburton Gel, Howco Gel, Hydrogel, Quick Gel,</td>
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<td>Max-Gel, Yolday, CMP 200, M-1 Gel</td>
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<td>Benzyl chloride</td>
<td>7 HAI-85M Acid Inhibitor, CI-300H Acid</td>
<td>Corrosion inhibitor, fracturing</td>
<td>130-44-2</td>
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<td></td>
<td></td>
<td></td>
<td>- Risk for cancer associated with cadmium exposure from population based study of high vs. low exposure</td>
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<td>Bisopropoymer</td>
<td>Propylene Bisopropoymer</td>
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<td>Polyisobutylene</td>
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<td>- Link to increase of leukemia in factory workers from the</td>
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<td>Cadmium</td>
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<td>Calcium carbonate</td>
<td>Satic-Carb 1 &amp; 2, Baracarb 25 #1, Baracarb 600</td>
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<td>471-34-1</td>
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<td>(sized)</td>
<td>#2, Baracarb 800 #1, Baracarb 130 #3, Calcium Carbonate</td>
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<td>Carbon</td>
<td>1 G-Seal Plus, LC-Glide</td>
<td>Drilling additive, lost circulation material, fracturing</td>
<td>7440-44-0</td>
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<td>- Associated increase in stomach and lung cancer among rubber workers by exposure to carbon black.</td>
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<td>Carbon black</td>
<td>1 Zytel</td>
<td>Resin, fracturing</td>
<td>1333-85-4</td>
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<td>Chromium</td>
<td>New Flow, Desco 65</td>
<td>Drilling mud additive</td>
<td>7440-47-3</td>
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<td></td>
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<td></td>
<td>- Through 15-year study, there is strong evidence between chromium exposure and increased cancer rates.</td>
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<td>Crystalline silica, cristobalite</td>
<td>Aquagel, Aquagel Gold Seal #2, Bocavid Oil Absorbant, Benoral X-Cide 207, Zetagel #2, Hydro-Plug, OSL Basie, Salt Water Gel, Ecomite, Baro-Trol Plus #1, Fresh Gel, Culture V, Howco Gel</td>
<td>Viscous sol in gel, unknown, biocide, lost circulation material, additive, fracturing, thix additive, weight additive</td>
<td>11464-46-1</td>
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<tr>
<td>Crystalline silica, quartz</td>
<td>14 Acrylic CR-4000D, Acrylic PR-6000W, Anco Gel, Anco Salt Gel, Aquagel, Aquagel Gold Seal #1,2, Benoral, Bentonite #3,4, Benstone 910,</td>
<td>Weighting material, unknown, sealer, viscosifier,</td>
<td>14808-69-7</td>
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</table>

**Guidance Notes**

- This document is intended for use by all employees of [Company Name].
- It is designed to provide guidance on [specific topic or area].
- Compliance with this document is mandatory for all personnel.

**Definitions**

- [Define key terms or concepts pertinent to the document.]

**Requirements**

- [List specific requirements or standards that must be met.]
<table>
<thead>
<tr>
<th>Distillates (petroleum), hydrocrated (mol) heavy paraffin (9C1)</th>
<th>Puredec HF-40</th>
<th>Mud base</th>
<th>S</th>
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</thead>
<tbody>
<tr>
<td>Ethanol (Acrolein alcohol)</td>
<td>MCI-85 M Acid Inhibitor, E104 Foaming Agent, F52, Sparquat 256, Betrorn K-47, Alpha 135, Le-surf-302M, Coastal 1135-C</td>
<td>Corrosion inhibitor, foaming agent, biocide, surfactant, disinfectant, unknown, fracturing</td>
<td>S</td>
<td>n/a</td>
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<tr>
<td>Ethyl silicate, partially hydrolyzed</td>
<td>1 Natural Gas Liquids</td>
<td>Unknown</td>
<td>6825-21-0</td>
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<td>Ethylene oxide</td>
<td>2 MCI-85 M Acid Inhibitor, Alkenol 1412.9</td>
<td>Corrosion inhibitor, unknown, fracturing</td>
<td>75-31-8</td>
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<td>Formaldehyde</td>
<td>STC (H-855-W), STC Water Soluble, Unknown product from PDEP, Resist Coated Silica, Lake, and Bank Sands and Ceramic. All Grades</td>
<td>Unknown, fracturing</td>
<td>50-00-0</td>
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<td>Fuel oil #2</td>
<td>Diesel #1, Invert Mudd, Pipe-Lax, Diesel low sulfur, FR-100, FRW-25, FRW-50, FRW-100, FRW-50-5</td>
<td>Drilling fluid additive, unknown, fracturing</td>
<td>58476-30-2</td>
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<td>Glycol</td>
<td>1 Epi-Zinc D-91, Epi-Vis Plus</td>
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<td>1422-22-5</td>
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<td>Oxygen respirable fraction (phosphorylpat)</td>
<td>Bentonite #3, Sili-Bond, Max-Gel, M-1 Gel</td>
<td>Drilling additive, stabilizer</td>
<td>13397-24-5</td>
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<td>Hexafluoroarsamide</td>
<td>1 Hexafluoroarsamide</td>
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<td>Hexane</td>
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<td>Fracturing</td>
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<td>Hydrated aluminum silicate</td>
<td>Resist Coated Silica, Lake, and Bank Sands and Ceramic. All Grades</td>
<td>Fracturing</td>
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<td>Hydrous-leached kaolinite</td>
<td>No 1 Diesel Fuel</td>
<td>Fuel</td>
<td>12742-81-0</td>
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<td>Isobutene</td>
<td>ZetaFlow #2</td>
<td>Fracturing</td>
<td>170-72-4</td>
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<td>Iron</td>
<td>Opgus, Opgus Plus, Opgus Thin</td>
<td>Thinner, emulsifier, surfactant, fracturing</td>
<td>7459-89-0</td>
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<td>Iron oxide (Fe2O3, Diuron trioxide)</td>
<td>Brown Fused Aluminum Oxide, Hi-Dense No.4 Weight Additive, Lioptor 6, Lioptor 3 Extender, Hematite Weighting Agent, Expanding Concrete Additive, High Strength Proppant, Fly Ash (Proxocem)23, BA-90 #2, Resist Coated Silica, Lake, and Bank Sands and Ceramic. All Grades</td>
<td>Cement extender, weighting material, proppant, fracturing, extender, unknowns</td>
<td>1309-37-1</td>
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<td>Isobutyl alcohol (2-methyl-1-propanol)</td>
<td>DWP-931, E2-Spot, P8-4871</td>
<td>Fracturing fluid, pipe release agent, unknown</td>
<td>78-43-1</td>
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<td>Ketone</td>
<td>Bara-Defoamer 1, Bara-Defoamer, No 1 Diesel Fuel</td>
<td>Defoamer, fuel, fracturing</td>
<td>8008-20-0</td>
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<td>Magnesium oxide</td>
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| Methylene 
(bistrichromate) 2        | MEC5.8, 
Bustan 1009 | Bisolde, fracturing                 | S         | 6317-18-9 |        |
| NaCl                 |             | pH control, fracturing, buffer, oil 
well drilling, fluid additive, calcium 
precipitation | P         | 144-55-8 |        |
| Naptha, petroleum liquid naphtha 2 | Crystal-Dil, 
Solvent 94 | Flocculant                          | S         | 64732-88-7 |        |
| Naphthene                     |             | Bisolde, drilling fluid additive, 
non emulsifying agent, fuel, acid 
inhibitor, fracturing, unknown 
paelatin inhibitor     | S         | 91-20-3 |        |
| Natural gas 
condensates 1         | Natural Gas 
Condensates | Unknown                             | S         | 68919-29-1 |        |
| Nickel sulfate                  |             | Corrosion inhibitor, fracturing, oxygen 
scavenger                        | S         | 7778-81-4 |        |
| n-Propyl alcohol               |             | Fracturing fluid additive, coagulant | S         | 71-23-8 |        |
| Octadecanoic acid              |             | Unknown                             | S         | 57-71-4 |        |
| Pararomatoidylhydride 1         | Trac-911, 
Fatty Acid | Unknown                             | S         | 8030-30-6 |        |
| Petroleum 
distillate (straight 
run middle distillate) 2       | ME-55, 
Do100W | Unknown                             | S         | 61744-14-2 |        |
| Petroleum 
distillate naphtha 7  |             | Breaker, unknown, fracturing        | S         | 8002-05-3 |        |
| Petroleum 
distillate naphtha 1   | Pipco-Free 40 | Unknown                             | S         | 8030-30-6 |        |
| Phenol                        |             | Resin Coated Silica, Lake, and Bank 
Sands and Ceramics, All Grades    | S         | 104-99-2 |        |
| Phosphorous, 
(tetrahydrogen 
ethyl) sulfate 2   | Magnasolce 575 #8 | Bisolde, fracturing                 | S         | 55566-30-8 |        |
| Polyvinyl alcohol 
(AkzoNobel 17H-3H) 2 | BioSealers, 
LAP-1 | Degradable seal, fluid loss control, 
fracturing                      | S         | 6803-89-5 |        |
| Potassium carbonate 3          | D-Ault, 
BF-2L #12 | pH control, fracturing             | P         | 564-08-7 |        |
| Potassium 
hydroxide 10          | CI-51, 
Potassium Hydroxide, Potassium 
Hydroxide Solid, BF-SC, BF-91, 
Custic Potash, 
Anhydrous, Deform, W.O. Deform, W9, 
BNL-2 | Fracturing, buffer, fracturing, 
unknown                | S         | 1210-58-3 |        |
| Quinoline 1                    | ZetaFlow #2 | Fracturing                          | S         | 891-22-5 |        |
| Silica, amorphous               |             | Cement extender, lost circulation 
material, fracturing           | S         | 61750-53-2 |        |
| Sodium chloride                |             | Friction reducer, 
coagulating agent, 
additive, unknown 
fracturing               | P         | 7647-14-5 |        |
| Sodium chloride (Chlorous acid, 
Sodium salt) 1 1              | Vicon NF | Breaker, fracturing                | P         | 7758-19-2 |        |
<p>| Sodium hypochlorite 1           | CAT-1       | Unknown                             | S         | 7681-52-9 |        |</p>
<table>
<thead>
<tr>
<th>Substance</th>
<th>Source/Code</th>
<th>Category/Use</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium nitrite</td>
<td>3 Nsco 39M #122</td>
<td>Corrosion inhibitor, fracturing</td>
<td>$^5$ Suspected role in gastric cancer by formation of mutagenic carcinogenic nitro compounds$^{15}$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td>1 EXP-D256C-99</td>
<td>Proppant, fracturing</td>
<td>$^5$ Styrene is suspected to cause cancer in humans; there are studies which reveal that repeated exposure to styrene generally causes cancer in animals</td>
</tr>
<tr>
<td>Styrene copolymer</td>
<td>1 Alpine Drill Bend</td>
<td>Drilling additive</td>
<td></td>
</tr>
<tr>
<td>Sulfur dioxide</td>
<td>1 Sulfur dioxide</td>
<td>Unknown</td>
<td>$^5$ Increased risk for exposed workers, in study on the pulp and paper industry workers in 12 countries, for lung cancer$^{17}$</td>
</tr>
<tr>
<td>Sulfuric acid</td>
<td>1 Poly-Burter</td>
<td>Surface cleaning agent</td>
<td>$^5$ IARC determined Group 1 - carcinogenic to humans: evidence of cancer to the larynx and lung$^{16}$</td>
</tr>
<tr>
<td>Thiourea</td>
<td>1 A 186 Corrosion inhibitor</td>
<td>Corrosion inhibitor, fracturing</td>
<td>$^5$ Not a high priority for the World Health Organization in terms of casualty$^{12}$</td>
</tr>
<tr>
<td>Titanium dioxide</td>
<td>2 High-Strength Proppant S140, Brown Fused Aluminium Oxide</td>
<td>Proppant, fracturing, unknown</td>
<td>$^5$ IARC class Group 2B - possibly carcinogetic to humans$^{18}$ Respiratory cancer in rats$^{19}$</td>
</tr>
<tr>
<td>Tributyl phosphate</td>
<td>1 Dehion H1B</td>
<td>Dehumidifier, fracturing</td>
<td>$^5$ Long term health effects for months or years after exposure, not yet tested for ability to cause cancer$^{13}$</td>
</tr>
<tr>
<td>Trisodium nitrobenzene</td>
<td>4 U106, U42, Barcort 100, U044</td>
<td>Chelating agent, corrosion inhibitor, fracturing</td>
<td>$^5$ Group 2B - possible carcinogetic to humans$^{20}$</td>
</tr>
<tr>
<td>Urea</td>
<td>3 Alcomer 60RD #2, Alcomer 123L, WPS Sticks</td>
<td>Flocculant</td>
<td>$^5$ n/a</td>
</tr>
<tr>
<td>Wood dust, soft wood</td>
<td>1 Sawdust Version 2</td>
<td>Oil well drilling fluid additive, lost circulation material</td>
<td>$^5$ n/a</td>
</tr>
<tr>
<td>Zinc chloride fume</td>
<td>1 Zinc Chloride Saturated Solution</td>
<td>Unknown</td>
<td>$^5$ n/a</td>
</tr>
<tr>
<td>Zirconium nitrate</td>
<td>1 Zirconium Nitrate</td>
<td>Crosslinker, fracturing</td>
<td>$^5$ Known to cause cancer in animals$^{21}$</td>
</tr>
</tbody>
</table>
Dear Review Committee,

I have grave concerns about the implications of hydraulic fracturing and I would like to add my voice to others who would like to see this form of testing banned in Nova Scotia. In particular, I would like to endorse the position of the Antigonish Harbour Watershed Association, as outlined in the attached letter.

Regards,
Maureen Moynagh
June 6, 2011

Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8

Dear Team of Senior Technical and Policy Staff,

We are a non-governmental organization called the Antigonish Harbour Watershed Association, who represent a large number of people concerned with environmental stewardship in Antigonish County. We are writing in response to the request by the government of Nova Scotia for input from the public on hydraulic fracturing in the province.

The Antigonish Harbour watershed consists of rural and municipal communities dependent on the quality of groundwater for its drinking water. Our community is in a region where healthy, unpolluted streams drain into an estuary that is a thriving ecosystem, providing important habitat for fish such as eels, smelt, seatrout, and Atlantic salmon, and wildlife such as black ducks, great blue herons and muskrats. Our transportation routes tend to follow the waterways, and thus have the capacity to impact these systems when they are either altered, or when accidents occur. In addition, the economy of this Northern Nova Scotia community is tied to maintaining the beauty and integrity of the natural environment. Many of our livelihoods are based on tourism, recreation, fishing, forestry and farming. Development in the natural gas industry, that includes hydraulic fracturing, has the potential to cause great harm to the community and its environment.

We want the government to review the process of hydraulic fracturing for shale gas very seriously, and consider banning it completely. The following are some areas that we find of particular concern.

1. Effects on groundwater: Even though regulations may be in place regarding drilling practices, it is known that accidents involving the cement casings do happen, and contamination of groundwater by the toxic fluids used is a real possibility. It may occur at any level of the well, even though the shale may be much deeper than groundwater.

2. Effects on surface water: Spills, during fluid transport on highways, and at well site, and storage sites are very real dangers from the hydraulic fracturing fluids. The array of toxic chemicals as yet unidentified to the public, would be a nightmare to clean up.
3. Impacts on land, such as potential soil contamination: Spills of fluids, and during transport of natural gas may contaminate soil. How will such soils be cleaned? Who is responsible? How will land owners be compensated?

4. Waste management, including surface ponds of produced waters: Hydraulic fracturing fluids come back up to the surface and the toxic 'waste fluids' must be stored or disposed of. The potential dangers of this aspect of drilling must be addressed.

5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids: All chemicals need to be identified, plans for spills transparent, and risks to health and environment explained to public. It is understood that the companies do not release the ingredients of their fracturing fluids.

6. Site restoration: What will be the scale, and who is responsible?

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province: There must be public transparency at all levels of development, and compensation must be fair, if this procedure is allowed to go on.

A review is currently being done in the US by the Environmental Protection Agency. A large number of wells have been drilled and natural gas extracted using the hydraulic fracturing process. I recommend that we not proceed with such development at least until the EPA's review has been made public and evaluated.

Many people don't know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just requesting public comments. We believe that the public consultation process should be approved by the public and include public forums.

Thank you for the opportunity to express our concerns. We urge you to act responsibly when considering the effects of hydraulic fracturing in Nova Scotia.

Sincerely,

Leslie Buckland-Nicks,
For the Board of the Antigonish Harbour Watershed Association
Room 9B, 2323 Notre Dame Ave, St. Francis Xavier University
Antigonish, Nova Scotia, B2G 2W5
antigonishharbour@gmail.com
From: Matthew Smith
To: "frac-review@gov.ns.ca" <frac-review@gov.ns.ca>
Date: 6/6/2011 4:03 PM
Subject: Hydraulic Fracturing Study

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442 Halifax NS
B3J 2P8

Please take any Hydraulic Fracturing endeavors in the Province of Nova Scotia seriously. Our groundwater is too valuable to experiment with. Too many people and ecosystems depend on a clean, reliable and safe groundwater resource to have a fracturing incident destroy and or contaminate it.

Another question to you is how does one restore the ecological integrity of an area exposed to fracturing. Is there enough monitoring capacity before fracturing is undertaken by a representative of the groundwater shareholders (citizens) or is monitoring and data being managed by consultants paid by the proponent?

I would suggest a ban on Hydraulic Fracturing in Nova Scotia before a catastrophe occurs.

Sincerely,

Matthew Smith
From: Lise Charbonneau
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 4:08 PM
Subject: Hydraulic Fracturing Study

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442 Halifax NS
B3J 2P8

I am not at all confident that hydraulic fracturing will not have a detrimental effect on our environment, including groundwater and air quality.

I don’t feel there is enough information provided about the chemicals used in the fracturing process, particularly the effect they can have on human health and the ecosystem, not to mention the transport of large quantities of these chemicals on our rural, often poorly maintained, roads.

I am concerned about the safety of our drinking water and the volume of water required for the fracking process itself.

I strongly urge the government to consider the safety of Nova Scotians and our children and not permit hydraulic fracturing.

Sincerely,

Lise Charbonneau
From: marke slipp
To: <frac-review@gov.ns.ca>
CC: Ramona Jennex <ramonajennexmla@bellaliant.com>
Date: 6/6/2011 4:22 PM
Subject: Re: Hydraulic Fracturing In Nova Scotia

~~~~~~~~~~~~To the Team of Senior Technical and Policy Staff from Nova Scotia Environment & Nova Scotia Energy,

Addendum to previous submission (See below):

It is important to have the perspective of our First Peoples when it comes to an issue like Hydraulic Fracturing, so I have reached out to find out their stance on this.

Roger Hunka, of the Maritime Aboriginal Peoples Council (contained in their Leaders Forum Statement), responded immediately noting MAPC is firmly opposed to this practice of 'fracking'. He reached out further to other Maritime groups and sent me their responses:
Native Council of Nova Scotia, opposed
Native Council of Prince Edward Island, opposed
New Brunswick Aboriginal Peoples Council, opposed very concerned.

~~~~

Further to your research on this subject, you would be well advised to be aware of concerns regarding this practice overseas as well:
https://secure.globetraider.com/servlet/ArticleNews/story/gam/20110602/RBBRTAINSHEALEMCCARTHY

In Britain recently, they have seen a link between fracking and earthquakes. A small energy company halted its shale gas drilling and hydraulic fracturing program in Britain after two mild earthquakes were recorded in the vicinity, an area where such tremors are rare.

I trust you will take all of the above into account and abandon the idea and the practice of shale gas drilling in Nova Scotia. I think you will find that most Nova Scotians are opposed to this development. I expect the main supporters of it would be those who stand to profit from it, either by land rentals, taxes or sale of the gas. These are not good people to take the word of.

Sincerely,

marke slipp

----- Original Message ----- 
From: 
To: frac-review@gov.ns.ca
Cc: Ramona Jennex:
Sent: Thursday, May 12, 2011 6:04 PM
Subject: Hydraulic Fracturing In Nova Scotia

To the Team of Senior Technical and Policy Staff from Nova Scotia Environment & Nova Scotia Energy,

After watching a film (GASLAND) on hydraulic fracturing ("fracking") the other night in Wolfville, along with the after-screening Q&A, I was motivated to write to you regarding this issue. I have many concerns about allowing this practice to happen in Nova Scotia. In fact, although I am no expert, from all I understand this should most definitely NOT be allowed to take place here.

The government should not simply "take fracking very seriously"; we need to ban the process of Hydraulic Fracturing completely. For the small benefits that will accrue, it is not worth the deleterious effects that will happen to the environment both around where this practice takes place and further away through its entrance into the water system (ground water & surface water and the coastal water).

There are precious few people that know much about what fracking does, what's involved, and who it affects. I think the Nova Scotia department of Environment is a good entity to inform residents of this province as to the hazards of going forward with fracking. I expect Nova Scotians will receive all the positive information they get from NS Energy, as they do with other energy schemes. Shale gas may be of some economic use, but perhaps it is better to leave this process to a generation down the road that could get a better price for it, and extract it in a more environmentally beneficial manner.

The most serious concerns I have with fracking are that: it involves very large quantities of water; relies heavily on toxic chemicals, involves clearing the land of all trees and vegetation; and leaves many toxins in the ground to interact with drinking water. To top it all off, these impacts are done to mine an energy resource that is not cheap nor clean. And it will likely be sold off to New England rather than be used here in Nova Scotia, just like offshore gas was, while it lasts. And like offshore gas, few jobs were created for Nova Scotians, but much profit for the oil companies resulted. And this was traditional gas ... not this 'squeeze-every-bit-out' approach that happens with fracking.

Nova Scotians living in the Annapolis Valley already have problems with their drinking water. The high levels of toxins in the water from agricultural fertilizers is already troubling. To add to this through the fracking process would be irresponsible for any government to allow. The so-called Windsor Block that is currently under consideration for fracking needs to be shut down immediately. Before any further consideration of fracking taking place in Nova Scotia, a complete list of the chemicals used in the process needs to be listed for the public.

I know you have an extensive review underway, covering everything from effects on ground water & surface water, through impacts on land & soil, to waste management, site restoration and other matters. I do not presume to be an expert on any of this, but I am familiar with the tactics of corporations when they want to exploit yet another resource. They are relentless, reassuring and speak only to the benefits that might happen, and lobbying government to allow them to have their way. I urge you to be sceptical of their claims and wary of their assurances. You state on your web site, "Our rules, regulations and monitoring are all designed to protect us against poor practices [sic]. Any drilling activity in this province must meet stringent environmental and operational requirements or it is not approved." This gives the impression you are ready to approve this process. I disagree with this vehemently.

As you know, water is one of the essentials of life. That there are already questions about the quantity and quality of water in Nova Scotia, both in our rivers, lakes and ground water, as well as the coastal waters of the province, needs to underscore any decision that is made. And every decision needs to be made in the context of our stewardship of the land, of the ecosystems in our care. What will be the effects on our grandchildren's grandchildren? Will we hand over a better place than we were given, or will we have allowed the exploitation of our resources to the point that they are depleted for our descendents? The First Peoples of this land looked at issues such as this from the point of view of "How will this effects people seven generations from now?" We need to follow this approach in our modern society, NOT the approach of "What can we exploit next?" The latter approach has brought much harm to our environment.
and our society.

Thank you for the reading about my concerns. I urge you to act responsibly and turn down this proposal when considering the effects of fracking in Nova Scotia. There may be a time in the distant future when the extraction of this gas could happen safely, it is not now.

Sincerely,

marke slipp
From: "Bernadette MacDonald" <bernadette@tricountywomenscentre.org>
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 4:36 PM
Subject: Women's Action Coalition of Nova Scotia - Submission
Attachments: Hyd. Fracking - WAC submission.docx

Hi:

Please accept our submission on behalf on many women in NS

Thank you

Bernadette

Bernadette MacDonald
Tri County Women's Centre
12 Cumberland Street, Yarmouth
Nova Scotia Canada B5A 3K3
Phone: 1(902) 742-0085
Toll Free: 1- 877- 742-0085
Fax: 1(902) 742-6068

<mailto:bernadette@tricountywomenscentre.org>
bernadette@tricountywomenscentre.org

<http://www.tricountywomenscentre.org/> www.tricountywomenscentre.org
Women’s Action Coalition of Nova Scotia  
c/o Food and Environment Working Group  
503 South Frederick Street, New Glasgow, Nova Scotia B2H 5K7

Hydraulic Fracturing Study  
Environmental Science and Program Management Division  
Nova Scotia Environment  
PO Box 442 Halifax NS  
B3J 2P8

June 6, 2011

Re: Hydraulic Fracturing Review

The WAC-NS is a broad-based non-partisan alliance of women’s groups and committees, social justice organizations and individuals concerned with women’s equality. Active in the 1990s, WAC-NS has been re-constituted in response to decisions that are being made at the national, provincial and municipal levels about issues that have a disproportionate impact on women.

On behalf of the Food and Environment Working Group of the Women’s Action Coalition of Nova Scotia we submit our comments to the review process of hydraulic fracturing in shale gas operations in Nova Scotia.

From the reviews we have undertaken in examining the hydraulic fracturing process the environmental impact, the land and water contamination, the massive use of water, the chemicals used in the process, the release of methane into the drinking water, to name some of the hazards, far outweigh benefits to the people and wildlife of Nova Scotia. As with any process that negatively impact our environment, women and children are disproportionally negatively impacted.

The damage fracking has done in many part of North America, both Canada and the USA, is well documented. We suggest you watch Gasland, a video documentary to hear firsthand the impact this process has had on people, water, animals, environment and landscape where this process has been carried out.

Within this study you are carrying out we feel you cannot do this in isolation of the climate implication of burning more carbon. We all know we need to reduce and eventually stop burning carbon and concentrate on the development of alternative energy sources from the sun, wind, tides, and potentially hydrogen, if we can do that without burning carbon.

We are at a turning point in our existence as the human species. To allow this type of mining would be counter to the direction we need to be seeking, which is, reduce and
eliminate our pollution, to live in harmony with our environment, and ensure the diversity of all life which we are so dependent on for our very existence.

We are a small province with the leadership abilities to be a great province by ensuring our land and water is safe and in turn a place where people want to come and live because it is safe and desirable for human and wild life habitation.

We are confident that your study will lead to the conclusion that the practice and regulation of hydraulic fracturing is not possible and a moratorium, with an eventual ban, on hydraulic fracturing in our province must be implemented immediately.

Thank you.

Sincerely:

Bernadette MacDonald

Food and Environment Working Group
Women’s Action Coalition of Nova Scotia
From: <frac-review@gov.ns.ca>
To: 6/6/2011 4:44 PM
Subject: Lake Ainslie Drilling

To Whom it may concern:

I the proposed dill site at West Lake Ainslie in Cape Breton. We have previously shown our disapproval of this drill site project by way of letters to our elected Government officials. This is not a project that should be able to go ahead at this time. This particular drill site is located about 600m from Lake Ainslie, which is the largest fresh water lake in Nova Scotia. Our concerns include almost daily news of "fracking" to be environmentally damaging to drinking water, animals, and also fish stock. Our concerns also include heavy truck traffic on our already deteriorated roads. We feel at this time to go ahead with this project next to Lake Ainslie would be environmentally irresponsible.

Your Truly
Valerie and J. Roland Williams
From: <frac-review@gov.ns.ca>
To: 6/6/2011 4:49 PM
Date: stop fracking-june62011
Subject: stop fracking-june62011

To the Hydraulic Fracturing Study, Environmental Science and Program Management Division, N.S.

Thank you for inviting Nova Scotia citizens to express their opinions and concerns regarding your proposed review of “fracking” in this beautiful province. To find out that some government leases have already been granted without prior public awareness is quite upsetting.

I realize that fracking is carried out in different areas of the world. However, I personally don’t agree with that practice. I am especially concerned about the incredible quantity of water, sand and other carcinogenic chemicals used in this technique. There are questions I have, as I am certain many people do, about where the water used originates from and how it is disposed of. I understand that an increase in the amount of large trucks can be an additional hazard and expense due to accelerated deterioration of our highways and secondary roads.

I fear for the safety of the occupants of our province. The health of our families and the wildlife could easily be thrown out of balance. Water that is contaminated by fracking could poison people and wildlife for generations to come!

I believe that there should be an independent evaluation that allows for full public consultation and access to information. There is not enough conclusive research effecting environmental and health concerns and until there is, there should be a moratorium or ban on the practice of hydraulic fracturing for shale gas in Nova Scotia.

Respectfully,
Krista Braun
From: "Douglas White"
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 4:52 PM
Subject: hydraulic fracturing and natural gas exploration

As a concerned Nova Scotian, I want a real, honest, open review of all aspects of shale gas exploration and ALSO a review of the advisability of extracting our energy supply and selling it now, rather than keeping it until we need it. Once we begin to sell it, NAFTA rules will force us to continue to do so, until it's gone. Hazards include: 1. Increased traffic on already overburdened roads. 2. Impact on farmland (they're not making any more.) 3. Earthquake generation. 4. Chemical spills. 5. Potential for fires. 6. Groundwater pollution. 7. WHOM will we sue for damages? I believe the risks are totally unacceptable. From Doug White.
From: <frac-review@gov.ns.ca>
To: Submission to The Review of Hydraulic Fracturing
Date: 6/6/2011 5:12 PM
Attachments: REVIEW OF HYDRAULIC FRACTURING.docx

Please find attached my submission to the review process.

David R. Stevenson
NS Departments of Energy and the Environment:

REVIEW OF HYDRAULIC FRACTURING

IN ASSOCIATION WITH

ONSHORE GAS EXPLORATION

By

In agreement with conventional natural gas exploration with:
- appropriate bidding for locations,
- publication of processes,
- public consultation,
- inspection by independent third parties.

Review of natural gas exploration procedures and requirements to include the following:

- publication of initial bids received followed by consultation with a public committee from each area to be affected by any process proposed by the bidder and applicant (in each case);

- filing of transportation plan containing
  i. expected (and within regulation) road loads,
  ii. timing of transport so as to reduce and mitigate disruptions to present (and local) traffic patterns,
  iii. responsibility for improvement by the bidder of roads that would be adversely affected by bidder transport activity,
  iv. remediation of public and private roads during and following use for the stated purposes by the bidder;

Submission to Hydraulic Fracturing Review

David Stevenson
- filing of air quality plan containing
  i. expected gas emissions at each and all locations of the bidder,
  ii. methods proposed for the containment and neutralization of all proscribed emissions;

- filing of baseline information containing
  i. seasonal water levels and availability for all surface water bodies, including current usage for domestic and industrial purposes,
  ii. mapping of all aquifers in the area of operations, including natural faults and their effects on water migration in the aquifer, together with current usage for domestic and industrial purposes,
  iii. seasonal water quality and availability at all residential well sources to be provided at the request of residents after wide public notice for testing and before any operations begin;

- filing of fresh water plan containing
  i. expected water requirements for each and all stages of the exploration at each site of operation,
  ii. proposed approved sources of water for each site and procedure, with the provision that no water above a prescribed limit would be permitted from any source,
  iii. storage of water on site so as to eliminate effects on land use adjacent to the operations site;

- filing of plan for chemical usage containing
  i. listing of all materials to be placed underground, be they expected to be recovered or otherwise,
ii. separate listings of any and all materials in “i” above that are known or suspected to be detrimental to humans, other animals and flora,

iii. procedures to store securely and to separately account for all materials listed in “ii” above at all sites and all times,

iv. permission from all affected levels of government for the use of all materials listed in “ii” above;

- filing of waste water plan containing
  i. procedures to hold on site in secure closed containment all water containing waste, with particular attention to water recovered from exploration operations,
  ii. procedures for recovery from operations’ waste water all contaminants prior to removal to third party locations,
  iii. procedures for secure transport of water no longer to be held at the site,
  iv. transport of water treated in “ii” above to predetermined locations for final testing and treatment prior to release into the environment, with the provision that municipal waste water treatment facilities be unavailable for this purpose;

- filing of disaster and emergency response plans containing
  i. details of mandatory safety and capture provisions at all stages for operational materials and procedures,
  ii. provisions for transport safety and for clean-up in the event of transport incidents involving vehicles carrying any and all materials,
  iii. detailed plans for the notification, removal, compensation and remediation affecting residents within areas to be determined by regulations,
  iv. contribution through additional resources and in payment for all resources needed in the activation of ongoing as well as emergency responses to operations,
v. full inspection of all operations on behalf of government by contracted third parties with the cost of inspection to be borne by the operator, with the power and requirement that any shortcomings be reason for curtailment of operations until shortcomings are remedied.

There will be other matters for consideration by the review team. Among them are financial considerations to be met by bidders and applicants. In all cases the bidders and applicants should be required to meet the costs of the provisions to protect the public in general, particular community areas, and the property investments of individual citizens in the province.

Of overarching concern to residents are decisions that could adversely affect the way of life enjoyed in the province. The review team is requested to hold the bidders and applicants to the highest standards and to inform residents of Nova Scotia of the avenues to ensure that successful bidders and applicants meet the standards.

David Stevenson
From: Leif Wege
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 6:01 PM
Subject: Fracking Scope Review - Sierra Club Canada Atlantic Canada Chapter
Attachments: SCC ACC - NS Gov Fracking Scope 001.jpg, SCC ACC - NS Gov Fracking Scope 002.jpg, SCC ACC - NS Gov Fracking Scope 003.jpg

Hello,

Please find attached written comments for the Hydraulic Fracturing Review Draft Scope.

Kind regards,

Leif Wege
Water Committee - SCC ACC
As a result of increased public and scientific concern surrounding the natural gas extraction process hydraulic fracturing ("fracking"), Sierra Club Canada Atlantic Canada Chapter (SCC ACC) is taking up this issue. Section 2 paragraph b(ii) of the NS Environment Act states, "the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation." The Sierra Club Canada Atlantic Canada Chapter (SCC ACC) believes threats of this kind exist around fracking and that enough information exists on the issue of fracking to warrant increased caution. The Government of Nova Scotia attaining more site- and context-specific information for Nova Scotia is in the interest of Nova Scotia citizens. As such, SCC ACC proposes the following additions and further questions to be addressed by the Review of hydraulic fracturing in shale gas operations in Nova Scotia.

Groundwater Impacts
- Water for Life: Nova Scotia’s Water Resource Management Strategy 2010 states, "One of the keys of water management is sound knowledge of provincial water resources," including understanding "impacts of activities on water." What baseline data will there be on the amounts of groundwater and how will these be investigated?
- What is the current quality of groundwater (i.e. contents of arsenic, uranium, etc.)?
- What will the draw down effects on the water table be?

Use and Effects on Surface Water
- What are the storage procedures for fracturing fluids and what efforts will be taken to site these storage facilities properly? (Sometimes there are just holding ponds with nets; Will they be lined? How long will the ponds be there? How long with proponents/government monitor them for leaking?)
- Will surface water be used for fracking? How much for each well?
- What is the reclamation plan for water that has returned to the surface?
- What is the lifecycle of water injected? How will this be determined?
- What tests would need to be performed on water quality by municipalities, private land owners, and other water users? How much will it cost private landowners and/or municipalities to test?
- How will these parties know what chemicals to test for?
- What protocols will be put in place for private well owners to test their water on a regular basis for the lifecycle of the fracking fluid in their water table?
- How will the province obtain funds from the polluting companies to pay for ongoing monitoring (on a timeframe of decades)?
- How will the province require disclosure of fracking fluids to the public for each well fracked?

**Waste Water Management**
- Is waste from other provinces going to be included in management plans?
- How much wastewater treatment capacity will be needed to deal with water from NS and NB operations?
- Produced waters could contain radioactive components like uranium, radon. How will these be monitored and this potential radiation be contained?

**Impacts on Land and Soil contamination**
- In order to determine effects, what is baseline data for soil quality?

**Site restoration**
- What will be done to fracking fluid ponds after the project is complete?
- How long will the site be monitored and what are the reasons for specific lengths of time?

**Insurance Issues**
- Are bonds going to be required to ensure no problems down the road? How long will funds be held in trust? Decades/centuries?
- Is insurance going to cover costs to homeowners, including increased insurance costs because of fracking going on nearby and possible loss of property values?

**Issues that must be added to the Scope:***
- Noise pollution can be substantial: 100 decibels at the source for single well (equivalent to jet aircraft 250 metres overhead). Please include impacts of noise pollution in the scope.
- Truck traffic will impact roads: what will be the impacts on existing road infrastructure, what new roads will be needed, and what are the increased costs associated with accommodating heavy truck traffic?
- What are the full life cycle greenhouse gas (GHG) emissions associated with fracking? This should include specific emissions resulting from site-clearing, transport, surface gas leaks, as well as emissions.
- Where are fracking fluids being produced and how will they be safely transported? These should be given as specifically as possible for each site.
- What federal authorities must the province comply with and how will the province coordinate activities with federal government?
Sincerely,

Fristan Sbrizzi  
Water Committee – SCC ACC

Leif Wege
From: meghan macculloch <
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 6:32 PM
Subject: Comments on fracking/onshore gas review

Dear Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment,

I have read your proposed review for Hydraulic fracturing in Nova Scotia and I am greatly disappointed and disheartened by its lack of scope and failure to include banning as a possible outcome of this review.

I believe the Nova Scotia government is not acting responsibly, nor representing the interests (or safety) of the citizens, when it proposes this weak review and actively promotes fracking at industry conventions in Texas and by putting land up for bid without consultation with the public, who stand to be affected immediately and for countless generations to come.

This review does not address the full effects of Fracking on our quality of life. Fracking will not only pollute water (the main focus of the review), but also will pollute air, soil and habitat. There is a strong likelihood of radioactive contamination and fracking will increase our greenhouse gas (GHG) emissions (recent studies from Comell University report that fracking emits more GHG than coal). The review focuses on “industry best practices,” which are completely inadequate and are an insult to sustainable practices for life in our province and in all places.

I am also concerned about the affects fracking will have on other vital economies in Nova Scotia, such as farming and tourism. There are strong social implications as well - already there is community division and conflict due to fracking and this will only increase. Please review these issues as well.

Immediately: any evaluation or review of fracking should be independent of government and allow for full public participation and access to information.

Yours, Meghan MacCulloch
From: <frac-review@gov.ns.ca>
To: 6/6/2011 6:38 PM
Subject: Re: Fracking in Nova Scotia

To Whom it May Concern:

My name is Marilyn MacDonald

My family has been in Cape Breton for 7 generations. We consider this place as our heritage home and have a strong vested interest in the social and economic development of our community.

From what I have learned from my search to understand what this process regarding “fracking” is, I most definitely and strongly oppose any development towards using this technology. It is not a process that has had a good safety record; there are many unknowns in the process and in my opinion, not worth the potential risks involved.

In the larger picture, I oppose any development for natural gas on our Island - it is not the economic future that I support. Much of the traditional industries such as tourism, farming, and fishing could be in jeopardy by any kind of this industrial development. I oppose that direction.

I would encourage our government to put time and resources into looking at ways to both reduce our energy use, to reduce our dependency on fossil fuels and also to fund development for alternate energy resources. That, I believe, is the way of the future -NOT going down the same old trail which can have irreversible damaging effects on our environment.

Believe me when I say: the majority of Cape Bretoners DO NOT WANT THIS KIND OF DEVELOPMENT ON OUR ISLAND!

Thank you for your time.

Sincerely,

Marilyn MacDonald
From: Nancy Webber
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 6:47 PM
Subject: Hydraulic Fracturing Review

June 6, 2011

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442 Halifax NS, B3J 2P8

Dear Team of Senior Technical and Policy Staff,

My name is Nancy Webber. I am submitting comments pertaining to the province’s review of hydraulic fracturing.

I am very concerned about hydraulic fracturing, and think it should be banned. I also believe that the public consultation process must be much more thorough and transparent.

Recent disasters, such as the nuclear reactor meltdown in Fukushima, the BP oil spill in the Gulf of Mexico, the pipeline leak in Alberta, and numerous other oil leaks and natural gas explosions, demonstrate that despite safety measures and assurances, such activities are inherently too risky. There are many reported cases of water and land contamination related to hydraulic fracturing in other jurisdictions all over North America.

Hydraulic fracturing, as well as the numerous unsafe (and unknown) chemicals used in the process, can too easily contaminate ground and surface water as well as land. The process creates “waste” ponds that can be dangerous for wildlife, and require long-term management to attempt to prevent additional contamination. Too frequently, industry does not follow through on commitments to best practices and restoration.

Instead of continuing to put more resources into the search for non-renewable energy, Nova Scotia should be investing more in renewable energy and reducing demand. If we hope to “recover” from our addiction to fossil fuels, we need government to demonstrate its commitment to real changes in energy policy and practices.

Nova Scotia’s beauty and natural resources are being eroded at an alarming rate; we need to protect our province, its environment, wildlife, and people before we lose too much.

Thank you for the opportunity to voice my concerns. I strongly urge you to act responsibly when considering the consequences of fracking in Nova Scotia.

Regards,
Nancy Webber
From: Rob McLean
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 7:54 PM
Subject: Call for input on scope of hydraulic fracturing review

To whom it may concern,

I have several concerns with the current scope of the hydraulic fracturing review.

They are as follows:

- The scope seems to centered on finding the "industry and regulatory best practice", when it has yet to be proven that hydraulic fracturing is in the best long-term interests of Nova Scotians. The precautionary principle is part of the Environment Act, and we must be sure that we are not taking undue risks.

- The identification of all fracturing fluid additives may prove to be difficult due to proprietary issues

- The time-scale of potential problems does not get mentioned - how long have current studies been going on, and how long does it take for problems to show up on the surface or in ground water? What I know of hydrology would have me worried more about effects 50 or 100 years down the line.

Thank you for your time,

Rob McLean
Dear Review Team:

I am forwarding a submission on behalf of the Board of the Antigonish Harbour Watershed Association regarding hydraulic fracturing in Nova Scotia (see attached file).

If you have any further questions about our organization or our submission please feel free to contact me.

Sincerely,

Rod Bantjes, Co-President,
Antigonish Harbour Watershed Association,
Room 9B, 2323 Notre Dame Ave, St. Francis Xavier University
Antigonish, Nova Scotia, B2G 2W5
www.antigonishharbour.org/
902-867-2479
June 6, 2011

Hydraulic Fracturing Study, Environmental Science and Program Management Division, Nova Scotia Environment, PO Box 442 Halifax NS, B3J 2P8

Dear Team of Senior Technical and Policy Staff,

We are a non-governmental organization called the Antigonish Harbour Watershed Association, who represent a large number of people concerned with environmental stewardship in Antigonish County. We are writing in response to the request by the government of Nova Scotia for input from the public on hydraulic fracturing in the province.

The Antigonish Harbour watershed consists of rural and municipal communities dependent on the quality of groundwater for its drinking water. Our community is in a region where healthy, unpolluted streams drain into an estuary that is a thriving ecosystem, providing important habitat for fish such as eels, smelt, seatrout, and Atlantic salmon, and wildlife such as black ducks, great blue herons and muskrats. Our transportation routes tend to follow the waterways, and thus have the capacity to impact these systems when they are either altered, or when accidents occur. In addition, the economy of this Northern Nova Scotia community is tied to maintaining the beauty and integrity of the natural environment. Many of our livelihoods are based on tourism, recreation, fishing, forestry and farming. Development in the natural gas industry, that includes hydraulic fracturing, has the potential to cause great harm to the community and its environment.

We want the government to review the process of hydraulic fracturing for shale gas very seriously, and consider banning it completely. The following are some areas that we find of particular concern.

1. Effects on groundwater: Even though regulations may be in place regarding drilling practices, it is known that accidents involving the cement casings do happen, and contamination of groundwater by the toxic fluids used is a real possibility. It may occur at any level of the well, even though the shale may be much deeper than groundwater.

2. Effects on surface water: Spills, during fluid transport on highways, and at well site, and storage sites are very real dangers from the hydraulic fracturing fluids. The array of toxic chemicals as yet unidentified to the public, would be a nightmare to clean up.
3. Impacts on land, such as potential soil contamination: Spills of fluids, and during transport of natural gas may contaminate soil. How will such soils be cleaned? Who is responsible? How will land owners be compensated?

4. Waste management, including surface ponds of produced waters: Hydraulic fracturing fluids come back up to the surface and the toxic 'waste fluids' must be stored or disposed of. The potential dangers of this aspect of drilling must be addressed.

5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids: All chemicals need to be identified, plans for spills transparent, and risks to health and environment explained to public. It is understood that the companies do not release the ingredients of their fracturing fluids.

6. Site restoration: What will be the scale, and who is responsible?

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province: There must be public transparency at all levels of development, and compensation must be fair, if this procedure is allowed to go on.

A review is currently being done in the US by the Environmental Protection Agency. A large number of wells have been drilled and natural gas extracted using the hydraulic fracturing process. I recommend that we not proceed with such development at least until the EPA's review has been made public and evaluated.

Many people don't know much about hydraulic fracturing or "fracking", and there should be a more transparent public consultation than just requesting public comments. We believe that the public consultation process should be approved by the public and include public forums.

Thank you for the opportunity to express our concerns. We urge you to act responsibly when considering the effects of hydraulic fracturing in Nova Scotia.

Sincerely,

Leslie Buckland-Nicks,
For the Board of the Antigonish Harbour Watershed Association
Room 9B, 2323 Notre Dame Ave, St. Francis Xavier University
Antigonish, Nova Scotia, B2G 2W5
From: Rod Bantjes
To: "FRAC-REVIEW@gov.ns.ca" <FRAC-REVIEW@gov.ns.ca>
Date: 6/6/2011 10:24 PM
Subject: Hydraulic Fracturing Review
Attachments: Fracking_Let_2011.doc

Dear Review Team:

I am writing to express my concern and caution regarding hydraulic fracturing in Nova Scotia. I would like to endorse the concerns expressed in the attached letter from the Antigonish Harbour Watershed Association regarding the ecological and social values of Antigonish County, where I live, as well as the potential risks that hydraulic fracturing poses to these values. Risk assessment involves consideration of three components: 1) the scale of the potential harm, 2) the likelihood of that harm coming about, and 3) the weighing of benefits against costs. All three, but particularly the latter involve uncertainty and questions of values (by this I mean ethical questions about what people think is right and desirable). There will no doubt be confidence in the minds of mining engineers that the likelihood of accidental harm from hydraulic fracturing is low - just as Japanese nuclear engineers would have assured us, if we had interviewed them just before the recent earthquake and tsunami, that the probability of meltdown was infinitesimal. However the potential harm of failures in hydraulic fracturing is high. The benefits have to be weighed in the context of the overarching challenges of peak oil and climate change. Rushing to unconventional techniques for extracting fossil fuels now is the wrong approach to both problems.

There is nothing to be lost by waiting to see how industry "best practices" prove themselves over time in other jurisdictions. The value of fossil fuels left in the ground will only increase dramatically as the globe passes peak oil. In fact I can't think of any more valuable legacy to leave for future Nova Scotians who may need high-grade transitional fossil fuels much more than we do at present. In time, companies will be willing and ready to pay much higher royalties and substantial bonds against unforeseen accidents, etc.

I have some confidence in the Nova Scotia government, led by the Department of the Environment, to write regulations for hydraulic fracturing to current standards. I have much less confidence in its ability to monitor and enforce those regulations. Departments of Energy and Natural Resources have historically been captured by industry interests, so Environment must lead on this. But the NS Department of the Environment receives roughly 0.33% of total government spending. The province of Alberta, internationally renowned for lax industry-compliant regulation of the oil sands, spends, proportionally, over twice that on its Environment Department (0.77% in 2009-10). I think at minimum, the royalty structure for NS unconventional fossil fuels development (which includes hydraulic fracturing) should be sufficient to fund a twofold expansion of the Environment Department's capacity.

Sincerely,

Dr. Rod Bantjes

(Word copy attached)
From: "Angela Giles" <agiles@canadians.org>
To: <frac-review@gov.ns.ca>
Date: 6/6/2011 10:36 PM
Subject: Fracking submission
Attachments: Fracking Submission NS June2011.docx

Hello,

Please find attached our submission for the review of hydraulic fracturing in shale gas operations in Nova Scotia. If you have any problems opening the attachment, please do be in touch.

Best,

Angela

Angela Giles
Atlantic Regional Organizer | Organisatrice régionale - Région Atlantique
The Council of Canadians | Le Conseil des Canadiens
211-2099 Gottingen St. | Halifax, NS B3K 3B2
Ph: (902) 422.7811 | 1.877.772.7811
fax (902) 425.7778 | cell: (902) 478.5727

Founded in 1985, the Council of Canadians is Canada's largest advocacy organization, with members and chapters across the country. If you believe that our social programs and public services should be strengthened, not privatized; that our foreign and trade policies should be independent, not subservient to the United States; and that our water and natural resources should be protected, not exploited, please join us as a member. www.canadians.org <http://www.canadians.org/>

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06 June 2011

Council of Canadians
Atlantic Regional Office
211-2099 Gottingen St.
Halifax, NS B3K 3B2
(902) 422.7811

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
Box 442, Halifax NS, B3J 2P8

Submitted via e-mail: frac-review@gov.ns.ca


The Council of Canadians is pleased to see that the Nova Scotia Government is reviewing hydraulic fracturing to determine if the risks are too great for our water and our communities.

There is ample evidence that shale gas companies use exorbitant amounts of water and harmful chemicals in the fracking process. We urge the government of Nova Scotia to ban fracking to protect water sources for current and future generations. Until a ban is implemented, we recommend that:

- All fracking projects should require a Strategic Environmental Assessment as well as a water permit from Nova Scotia Environment.
- Industry should be required to disclose all substances used in the fracking process until a ban is implemented. (Given that there are no fracking permits requests at this stage, this should be a non-issue.)

Process:

Some of our members have raised concerns with this process. There is no framing question, such as, “Should fracking be allowed in Nova Scotia, or is the potential for harm too great?” or “What environmental affects will result from hydraulic fracturing in Nova Scotia and can these be controlled or mitigated by effective regulatory practices?” These would allow submissions to be more focused on recommendations for the committee to consider.

Although the concerns around water are great, they are several other concerns we have with fracking (see below). We recommend that the Nova Scotia Government broaden this review to include other environmental concerns.
Additionally, since many people do not know much about hydraulic fracturing or “fracking”, there should be a more transparent public consultation than just public comments. Once the submissions have been reviewed and the government has finalized the terms of the study, we hope there will be further opportunities for Nova Scotians to engage in this process in a more detailed and meaningful way.

**Other Environmental issues:**

Other major environmental concerns with the fracking process include air quality concerns, environmental degradation, soil, forests, and wildlife. Economic impacts include tourism, farming as well as property values. Health concerns as a result of the chemicals used in the fracking process are extensive. Many of these and others also have a concentrated impact on rural communities and rural quality of life. (Council of Canadians factsheet “No Fracking Way: Hydraulic fracturing causes serious risks to health and water” available at http://www.canadians.org/water/documents/fracking/factsheet-1110.pdf.)

**Water:**

Hydraulic fracturing or fracking poses a significant threat to Nova Scotia’s water sources. The fracturing process uses vast and unsustainable amounts of water. The toxic chemicals used in the fracturing process further pollute Nova Scotia’s already vulnerable water sources. The ‘wastewater flowback’, a mixture of toxic chemicals, is either buried in the ground threatening local aquifers or put through municipal wastewater treatment systems which are ill-equipped to handle the chemicals used in fracking projects.

**Nova Scotia’s Aquifers**

Throughout Canada, ground water aquifers are generally found within 100 metres of the surface. The water table in Nova Scotia is generally located within approximately 5 metres of the ground surface, but can be further underground in regions with higher topography, such as the Cape Breton Highlands. Since shale formations are usually found within 110 – 4000 metres of the surface, groundwater aquifers are at risk of contamination which in turn threatens communities’ drinking water.

According to Nova Scotia Environment, “Of the 82 municipal water supplies in Nova Scotia, approximately 34% obtain their water from groundwater sources and 12% use a combination of groundwater and surface water. In addition, groundwater supplies are used by most of the small registered public water systems in Nova Scotia, which provide water to facilities such as rural schools, day cares, nursing homes, restaurants and campgrounds.”

Fracking puts groundwater sources and consequently drinking water at risk of contamination.
Water Problems in Nova Scotia

Nova Scotia’s water sources are already vulnerable due to climate change, pollution and acid rain.

Climate Change and the Impact on Water Sources

Although there is an increase in overall precipitation due to climate change, there are hotter, drier and longer summers in Nova Scotia. According to Ecology Action Centre, the increased temperatures and extended summers result in reduced moisture in the soils and changes in the population structure of rivers, lakes and wetlands. This has a direct affect on municipal water supplies. Increased evaporation results in decreases in water levels and increases in the concentration of pollutants. Lower water tables in areas adjacent to the ocean may result in influxes of saltwater affecting freshwater species and contaminating the groundwater on which local residents rely. Southern Nova Scotia, which is very dependent on groundwater for drinking water, and low-lying and adjacent to the Bay of Fundy, would be especially vulnerable.

Natural Resources Canada's 2007 report Climate Change Impacts and Adaptation Program noted the following trends on water and climate change including:

- Some coastal communities have started experiencing saltwater intrusion in their groundwater supply.
- Variations in precipitation will combine with higher evapotranspiration to induce drier summer conditions. Limited water resources would affect municipal water supplies and challenge a range of sectors, including agriculture, fisheries, tourism and energy.
- Although higher temperatures and longer growing seasons could benefit agriculture and forestry, associated increases in disturbances and moisture stress pose concerns.

Water Pollution

According to the Ecology Action Centre, Nova Scotia’s water is threatened by various sources of pollution including non-point source pollution such as urban runoff (oil from cars, heavy metals, lawn pesticides, garbage, bacteria from animal and human waste, pharmaceuticals), agricultural runoff (pesticides, fertilizers, erosion, bacteria from livestock feces), and forestry runoff (causing erosion and sedimentation). Point source pollution includes sewage outfalls and industrial discharges.

Ecology Action Centre has noted that water-use of eight Halifax Regional Municipality lakes was restricted due to high bacteria levels: Chocolate Lake, First Lake, Grand Lake, Long Pond, Springfield Lake, Williams Lake, Russell Lake and Morris Lake in 2007.

Acid Rain

According to the Ecology Action Centre, Nova Scotia receives over double the amount of acid rain its ecosystems can safely handle each year. Nova Scotia is the most heavily impacted province in Canada.
in terms of the percentage of fish habitat that has been damaged or destroyed by acid rain - and the only region in North America where entire river systems have been acidified by this process.

Water Use

Fracking uses massive amounts of water. Approximately 2 to 9 million gallons of water are required for a single "fracking" job. In the report Fractured Lines, Ben Parfitt notes that in fracking 10 shale gas wells in British Columbia’s Horn River Basin required 909,090,000 litres of water.

Allowing fracking projects to continue would seriously threaten Nova Scotia’s already strained water sources.

Toxic Chemicals

A four billion gallon fracking project requires 80 tonnes (200,000 gallons) of chemicals. Industry is not required to release what chemicals they use in fracking projects. However, some chemicals found in fracking fluids in the US include ethylhexanol, formaldehyde, glutaraldehyde, boric acid, ethylene glycol, methanol, monoethanolamine, dazomet, acetic anhydride, isopropanol, propargyl alcohol and diesel. The New York State Department of Environmental Conservation’s Division of Mineral Resources released a massive report which listed 257 additives that may be mixed with the water.

The fracking process also brings up radioactive elements from underground. There has been anecdotal evidence that fracking fluids have leached uranium. There is also radon and radium-226 in shale deposits.

Water Contamination

The use of these toxic chemicals would contaminate Nova Scotia’s already vulnerable water sources.

ProPublica reports on contents of fracking fluids and contamination of nearly 1000 rural wells by the shale gas industry in the US.

Duke University recently released a report on methane contamination of drinking water within one kilometre of hydraulic fracturing sites. The report found that “Methane concentrations were detected generally in 51 of 60 drinking-water wells (85%) across the region, regardless of gas industry operations, but concentrations were substantially higher closer to natural-gas wells (Fig. 3). Methane concentrations were 17-times higher on average (19.2 mg CH4 L–1) in shallow wells from active drilling and extraction areas than in wells from nonactive areas.”

Sand and chemicals from one site has been found to contaminate other sites; what industry euphemistically calls ‘communication’ between sites. Fractured Lines notes that “sand being pumped underground during fracking at one well showed up at the other in Montrey Basin in British Columbia. The British Columbia Oil and Gas Commission reported that it was aware of at least 18 contamination incidents ranging from 50 to 715 metres apart which raises serious alarm bells when it comes to our drinking water sources. If contamination of sand and chemicals can occur horizontally
from site to site, it stands to reason that contamination can vertically from the fractured shale to ground water aquifers.”

Further, while immediate effects may not always be detected, Professor of Engineering, Tony Ingraffea, from Cornell University notes that the effects of fracking are cumulative. Professor Ingraffea has noted that there is one serious environmental concern for every 150 wells drilled today in the US which means if there are hundreds of thousands of wells, there are hundreds or thousands of serious impacts. He highlights the cumulative impacts of fracking so although communities may not be seeing some of the consequences today, communities will see the effects of fracking in 10 or more years.

Health Problems Related to Fracking Chemicals

Fracking chemicals have been linked to significant health problems and have been associated with bone, liver and breast cancers as well as developmental, gastrointestinal, circulatory, respiratory, brain and nervous disorders

Wastewater Flowback

The wastewater or what is termed ‘wastewater flowback’ is either injected deep underground which risks leaching into the ground or nearby water sources or treated at municipal wastewater facilities which are not equipped to decontaminate fracking wastewater. If discharged into waterways, the wastewater flowback puts our drinking water supplies at risk.

Water as a Human Right and Public Trust

Nova Scotia needs to implement a water allocation system based on water as a human right and public trust. Water as a human right would ensure that water for domestic needs, the environment and community uses are a priority. Water as a public trust would ensure that governments manage water and an allocation system ‘in trust’ for the people or in the public interest.

Last year the UN passed two resolutions recognizing the human right to safe and clean drinking water and sanitation. The second resolution passed by the UN Human Rights Council recognized the human right to water and sanitation as already entrenched in international law. Therefore Canada has a legal obligation to uphold the human right to water and sanitation. If a corporation is using our collective water to make profit, they should pay a hefty licence fee. This would be under the public trust doctrine and no one would own that water but they would just be granted a license to use it.

Under a human right and public trust doctrine system, governments would need to be very careful who they give water licenses to and be able to revoke them if abused. Under the public trust doctrine, no one would or should have the right to "buy" water to pollute or to bottle it.

The Environmental Act
While the Act has several requirements aimed at environmental protection and sustainability such as hydrology reports from registered professional engineers, qualified hydrologists or other qualified persons, evaluations of potential effects, long-term plans to monitor stream flow and public consultations, the Act does not recognize the human right to water and fails to prioritize domestic and community use over private, for-profit use.

Under the Activities Designation Regulations (Division I) of the Environment Act, any individual or entity withdrawing surface or ground water exceeding 23,000 litres per day must obtain a water withdrawal approval from Nova Scotia Environment. For ground water this requirement only applies to water withdrawal exceeding two weeks. The Guide to Surface Water Withdrawal Approvals and Guide to Ground Water Withdrawal Approvals stipulates that "water allocations are based on a "first-come, first served" basis. Priority is given to existing withdrawal approvals over new applications."

Under the Environment Act and Regulations Fees Regulations, annual user fees for water withdrawals are determined only by the quantity of water used. Regardless of whether the water is being used for municipal, recreational, industrial or domestic purposes, users pay the same amount. For example at users are required to pay $133.95 per year for water use of 1 000 000 L per day up to 2 000 000 litres.

Shale gas companies requiring water for fracking projects which results in wastewater flowback would pay the same amount for water municipalities use to supply drinking water.

There is ample evidence that shale gas companies use exorbitant amounts of water and harmful chemicals in the fracking process. We urge the government of Nova Scotia to ban fracking to protect water sources for current and future generations. Until a ban is implemented, we recommend that:

- All fracking projects should require an environmental impact assessment as well as a water permit from Nova Scotia Environment.
- Industry should be required to disclose all substances used in the fracking process until a ban is implemented.

Thanks for your consideration,

Angela Giles
Atlantic Regional Organizer | Council of Canadians

Emma Lui
National Water Campaigner | Council of Canadians
Sources:


BC Tap Water Alliance: http://www.bctwa.org/FrackingBC.html

Conservation Council of New Brunswick, Fracking Primer:
http://conservationcouncil.ca/files/Publications/FrackingPrimer_Final.pdf


Deveau, Jean-Louis. No Fracking Way: Ban Hydraulic Fracturing in Canada:

Environment Act. 1994-95, c. 1, s. 1.

Ecology Action Centre Freshwater Resources: Water Issues in Nova Scotia
http://www.ecologyaction.ca/content/water-issues-nova-scotia

Nelson, Joyce. Watershed Sentinel: "Fracking-Natural Gas Affects Water Quality"
http://www.watershedsentinel.ca/content/fracking-natural-gas-affects-water-quality


Parfitt, Ben. "Fracture Lines: Will Canada's Water be Protected in the Rush to Develop Shale Gas?"

"This is not your Grandfather's Gas Well": http://www.bctwa.org/Frk-NotYourGrandfather.pdf

To whom it may concern,

I urge the N.S. Government to consider ALL the impacts when conducting the fracking review and study. From my perspective this review is only looking at the fracking process and studying which are "best practices" to employ. This can hardly be considered a complete review. The N.S government must take a long hard look at the overwhelming evidence that the fracking process has massive environmental and social impacts, many of which are irreversible. I wonder how many wells, ponds, streams and rivers need to become polluted before the risks of fracking are taken seriously? Does the fact that many countries around the world are scrutinizing fracking, insisting on better science and further study and imposing bans, display that the book is not closed on fracking. We need to do a complete cost/benefit analysis. As someone who lives in an area slated for shale gas exploration I insist that this analysis is conducted prior to any lease's granted.

The key issue here is that this decision needs to be a scientific decision rather than a political decision. This is very important. Think about it...you...reading this right now...think about it.

Do the research, find information (not just from energy and gas proponents) and make a scientific decision which also must incorporate the precautionary principle. Which itself is part of the N.S. environment act, (section 2 (b) ii) "the precautionary principle will be used in decision-making so that where there are threats of serious or irreversible damage, the lack of full scientific certainty shall not be used as a reason for postponing measures to prevent environmental degradation".

Therefore, I do not consider this review of "best practices" suitable. I see once again a decision based on politics and corporate backscratching, not a decision based on real science or the precautionary principle and certainly not with the health of citizens in mind. Anybody in a leadership position worth their salt understands that the solution to the economy and jobs should never compromise the integrity of the environment. It will always be a net loss. Long after the "fracking money" is gone the real cost will become more evident. What is the price tag of a river, an ecosystem, a farm. How many long term health problems will we be paying for? Asthma, cancer, degenerative disorders, the list goes on. How much more burden can our health care take? The continual decline in property value (who wants an explosive well? Or ethyl glycol in their water?). What about traffic? So much for quiet rural life or a casual drive. If we have any money left from paying for our destroyed roads we might be able to fix our vehicles after driving on them. How about the air quality? Wyoming is experiencing air quality conditions worse than L.A.. School day's have been canceled with advisements to not go outside. Do you know what effects ozone or volatile organic compounds have on lungs?

In closing I find it alarming and hypocritical that if my heating oil tank leaks the site is deemed hazardous waste, requires a stringent clean up process and I might be fined for negligence. Yet gas companies can pump thousands of gallons of toxic chemicals at very high pressure deep into the ground, much of it not being recovered and somehow it's considered a safe practice.
With hope that you take my concerns seriously,
sincerely, Antonio DeNicola
From: Therese Bombardier  
To: <frac-review@gov.ns.ca>  
Date: 6/6/2011 11:35 PM  
Subject: Stop Fracking around please!

Dear Team of Senior Technical and Policy Staff,

My name is Therese Bombardier

and I use water everyday just like everyone else in the world. I love my local rivers and lakes. I love that there are so many lakes I can bike to in under 30 minutes to cool off in, relax by and even listen to.

I am submitting comments relating to the province’s review of hydraulic fracturing. I want the government to take fracking very seriously, and also consider banning the process completely. Many people don’t know much about hydraulic fracturing or “fracking”, and there should be a more transparent public consultation than just public comments.

**

I am very concerned about the effects fracking will have on the following:

**

1. Effects on groundwater
2. Use and effects on surface water
3. Impacts on land, such as potential soil contamination
4. Waste management, including surface ponds of produced waters
5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids
6. Site restoration
7. Financial security / insurance that operators are required to provide prior to conducting activity in the province

Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Sincerely,
Therese Bombardier

-There are no passengers on Spaceship Earth. We are all crew. ~Marshall McLuhan, 1964
From: Ann Hennigar  
To: <frac-review@gov.ns.ca>  
Date: 6/6/2011 11:59 PM  
Subject: views on fracking

I was appalled to learn that the NS government has already allowed hydraulic fracturing in test wells near Kennetcook and signed leasing agreements to large tracts of land for this purpose. It seems that this process has already been deemed acceptable by the NS government and that all that is required to prevent problems is to take adequate precautions.

A good look at the process will show you that there are no adequate precautions and that this is not a "green" way to produce energy. Not when thousands of gallons of dangerous chemicals, some of which are known to be carcinogenic, are being put into the ground, only some of which are able to be recovered, and where and how are even those being disposed of? And how is the fracturing of the geological structure of the sub-surface going to affect our soil, our water supply, even the stability of the geology in the area? There have been many reported cases of water and soil contamination in the US and western Canada, and even minor earthquakes in some parts of the United States.

The effects of numerous "fracking" mines on our landscape and the consequent industrialization of our rural areas will also endanger the tourist industry and the quality of life for Nova Scotia's residents.

There are many other reasons which I'm sure you have been made aware of as to why hydraulic fracturing is not a good choice for energy production. I won't go into them all here.

As a card-carrying member and an NDP supporter for over 40 years I ask you to reconsider the direction you are taking on this issue. The environment should be your number one issue. Anyone with vision should be able to see that that is all that really matters. Leadership is needed here to say "Stop". Say no to the corporations who would rape this province and move on without a backward glance. Focus on our real assets which are becoming rarer day by day as a result of the exploitative mindset that seems to be so prevalent in the world today.

At the very least please call a moratorium on fracking in the province and set up a comprehensive environmental review and a round of public hearings on the issue. I believe Nova Scotians want to be led by a government that provides them with the opportunity to speak out and that shows it understands what it is about this province that makes it so special and seeks to protect it, not destroy it.

Ann Hennigar.
From: <frac-review@gov.ns.ca>
To: "Premier Dexter" <premier@gov.ns.ca>, "Jim Morton" <jimmorton@kingsnorth...
CC: 
Date: 6/6/2011 2:50 PM
Subject: written submission

Attention: Frac Review Committee
Nova Scotia Department of Environment

I am writing to express my concerns about fracturing for shale gas in Nova Scotia. Much has been written of late about this method of satisfying our growing needs for energy which has moved me to respond to the the Government’s request for for citizen input. I am an ordinary citizen living in the Annapolis Valley who has read many press releases emanating from the negative impacts this has had in some parts of the United States and Great Britain and do wonder why we would even consider opening the door to this, however limited the potential for harm might be. While I understand that there are potential economic gains to be made - a limited amount by local communities through employment possibilities, a lot by the energy companies involved in the shale gas production and very little by the Province as a whole after taking into account the initial two year royalty free offering - I believe this should not be used as 'a carrot on a stick' to entice Nova Scotians into thinking there will gains without loss. As the population on the planet increases (2 billion when I was born, 67 years ago, and now nearing 7 billion) I think we need to operate from a very different mind set regarding all our resources - priority being given to those essential to human health and survival i.e. WATER AND SOIL. Deep well drilling, pouring millions of gallons of water laced with a soup of chemical additives and extracting only a portion of this toxic mix to be trucked and dumped where??? to satisty our (human) addiction to fossil fuels does not bode well for future generations seeking to live in Nova Scotia. Regulating the industry is a questionable solution.

It is my sincere hope that this Government will follow the examples of others eg. France, Quebec and call for a moratorium on all shale gas drilling. It is time for courage - courage to embark on serious promotion for the development of sustainable energy such as wind and solar AND to launch a campaign to educate all Nova Scotians about the essential need to reduce our energy consumption. Addictions are a challenge to overcome but it can be done!

Thank you for the opportunity express my opinion on this important matter.

Sincerely,

Linda O’Neill
From: "Robert Bernard"
To: <frac-review@gov.ns.ca>, "Allan MacMaster" <macmasag@gov.ns.ca>, "And...
Date: 6/7/2011 10:54 AM
Attachments: fracking letter (Madonna B).docx

Letter to the Frac Review Committee

May 6th, 2011

To Whom It May Concern,

My name is Robert Bernard

site of the proposed PetroWorth Drilling Site

in Lake Ainslie, Nova Scotia. Over the past year, our people here in our
community have gone through quite a process in terms of trying to understand
the potential harmful effects that this proposed drilling may cause to our
environment if this project is approved. With so much information that
needs to be adequately provided to residents, not only from our Mi'kmaw
community but for all communities potentially affected by this project, it
is astounding that the Province would not engage in a much more informative
process whereby people are given due notice, due process and above all
respect for their own livelihoods, traditional living practices and to say
the least the potential health and welfare if such a project goes through.

With the Province not having established regulations with respect to a Clean
Water Act or Safe Water Act, and with the international concern that is
evident in the news regarding "Fracking Concerns", it would only make sense
to carefully ensure that the best interests of the people are primary before
economic and financial opportunities take liberties on the lives of our
people in Nova Scotia. With so many Provinces and countries around the
world taking positive steps towards developing policies that ensure
meaningful consultation taking place with community groups, environmental
organizations that lead towards a common vision of protecting our people's
future - it helps us to step back to take a look at where we are in our
Province. Are we there yet? No! Can we get there? Yes!! Are we willing
to make it happen in the way that it needs to? I'm not sure - government
has to listen to the people to get to the heart of where this is all at and
where it is leading to.

To be very truthful, this wasn't a concern to me at the very start as I
wasn't aware of the potential harmful effects that this could have to our
community's drinking water, our environment, our traditional medicines that
our Elders and their mentors gather. until something clicked to make me
realize that the people in power were not giving this enough attention. You
know, people stand up for different reasons, people speak up for different
reasons, people are concerned about their families, their safety, their
children's future - now put yourself in those shoes and reflect at all the
information that has passed into your hands. This is not about Nova Scotia
needing more money, more corporate companies to control our resources and it
is certainly not about elected representatives of government catering to
their needs. You were voted in by the people to help and protect the people
- and this is what they need now.
Our small community of 800 people came together and stood up when PetroWorth came to offer money and jobs and an economic boom - they said "Hell NO!" - they brought their children, their concerns about the future and something that our culture has done for many centuries is that when the women and mothers stand up to speak, everyone listens - they can sense something bad coming. We all agreed that we needed to address the community's concerns with respect to fracking but beyond this was to help improve our own ways of protecting our environment. We set up our own community Waycobah Concerned Citizens Group (WCCG) and had many meetings and submitted a "Waycobah First Nation Environmental Declaration" to our Chief & Council with over 250 signatures (copied and sent to all governments/departments). We realize that things take time and that we cannot solve all problems, but also it takes a genuine will and desire for people to make positive change happen.

My own family, my wife, children and extended family can't understand why we would jeopardize the beautiful and natural wonders of our natural environment here, it is so peaceful and clean. Many people including us feel strongly that this will all change real fast IF industry companies are allowed to walk in without some type of process that allows people to have a say. We understand that they have stated that they will not "Frack", yet their website information was full of it until people caught on and then they even made changes to ensure that any visitor to their sites would agree to a disclaimer and that their information was now "forward looking statements of proposed activities". Shady people. We realize that this is much more than the Fracking issue, it's the entire industry that has to be scrutinized in detail with a fine tooth comb. This whole shale extraction is coming at such an environmental costs to many states and provinces and countries that it is not worth the proposed jobs and money. At one of our last meetings someone mentioned about the fact that if an emergency situation happened in one of these sites, the first people to have to deal with these explosions or cleanup would be the Emergency Units (ambulance, Firemen, etc) and they are not properly trained in these methods, nor are the doctors and nurses that may have to treat these people. Many things to consider here.

We are all very concerned of the unknown and we have asked questions, many of which could not be answered good enough for us to ease our concerns. We have to have faith in our leaders to stand up for us and to protect our rights as the original inhabitants of our land that people call Nova Scotia and that we've called home for many, many centuries. We want to know what is ahead of us, we want to see and understand what we are potentially walking into, and people just want to be respected enough so that they don't feel that they are walking into the dark not knowing where this whole process will end up at the end of the day.

Our people have this traditional way of planning, it's called the Seven Generations Planning Model. You do today what you hope will be the best for the generations of children and families to come in the next 7 generations.
Primary to all of this is respecting Mother Earth and its bounties and never taking more than what you need in life, from the environment, your friends and family and always giving back. If you give back, you will always live a life of bounties. If you take more than what you need, the Creator will always teach us a lesson when the time is right.

In the spirit of light and direction and the protection of our land and resources, listen to the people, listen to what they need. They need you as leaders that stand up to make sure that the next steps are safe and secure for everyone with respect to drilling and shale exploration and extraction processes that are proposed.

PS: Attached you will find a letter from one of the parents here that wanted to make sure she sent in her concerns as well, there are many around here that feel the same way.

Thank you for your valuable time and all the best to you all with respect to finding a solution to these mounting issues.

Wela'lioq (I thank you),

Sincerely,
Robert Bernard
Dear Team of Senior Technical and Policy Staff,

My name is Madonna Bernard

I am from …

I am Writing to you today Regarding the fracking process. I have 3 children who are scared of what we would do if the big company (Petro Worth) were to start drilling/ fracking for oil here! We love to camp and fish, and when this fracking process begins, it will all seep into our water, it will no longer be good to fish our water supply no longer good to drink, we will no longer be able to swim in our lake!!

1. Effects on groundwater

2. Use and effects on surface water

3. Impacts on land, such as potential soil contamination

4. Waste management, including surface ponds of produced waters

5. Identification and management of additives (including volatility and fate in the environment) in hydraulic fracturing fluids

6. Site restoration

7. Financial security / insurance that operators are required to provide prior to conducting activity in the province Thank you for the opportunity to hear my concerns. I urge you to act responsibly when considering the effects of fracking in Nova Scotia.

Sincerely,

A very Concerned Citizen with Children!

Madonna Bernard.
Good afternoon.

Please find attached a submission to the review of hydraulic fracturing for shale gas in Nova Scotia.

Regards,

Michelle Williams
Assistant, Atlantic Canada
Canadian Association of Petroleum Producers
403, 235 Water Street
St. John's, NL A1C 1B6
Tel: (709) 724-4200
Fax: (709) 724-4225

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June 8, 2011

Hydraulic Fracturing Study
c/o Environmental Science and Program Management Division
Nova Scotia Environment
P.O. Box 442
Halifax, N.S. B3J 2P8

The Canadian Association of Petroleum Producers (CAPP) and the Canadian Society for Unconventional Gas (CSUG) thank you for the opportunity to provide the attached submission to the review of hydraulic fracturing for shale gas in Nova Scotia.

Canadian Association of Petroleum Producers

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Submission to

Government of Nova Scotia
Hydraulic Fracturing Review

Canadian Association of Petroleum Producers

And

Canadian Society for Unconventional Gas

June 6, 2011
The Canadian Association of Petroleum Producers (CAPP) represents companies, large and small, that explore for, develop and produce natural gas and crude oil throughout Canada. CAPP’s member companies produce about 90 percent of Canada’s natural gas and crude oil. CAPP’s associate members provide a wide range of services that support the upstream crude oil and natural gas industry. Together CAPP’s members and associate members are an important part of a $110-billion-a-year national industry that provides essential energy products. CAPP’s mission is to enhance the economic sustainability of the Canadian upstream petroleum industry in a safe and environmentally and socially responsible manner, through constructive engagement and communication with governments, the public and stakeholders in the communities in which we operate.

The Canadian Society for Unconventional Gas (CSUG) is a not-for-profit association formed in 2002 with a focus on broadening the understanding of unconventional natural gas resources and the technology to develop those resources among industry, government, regulators and the public. CSUG encourages constructive dialogue among all unconventional gas stakeholders based on a foundation of informed technical understanding. CSUG’s membership includes natural gas exploration and production companies, service and engineering companies, research organizations and universities, and other organizations.

CAPP’s and CSUG’s Interest in the Review

Our understanding is that the Province of Nova Scotia will review the environmental issues associated with hydraulic fracturing. The Province aims to identify potential environmental issues, determine how they are managed in other jurisdictions and identify industry best practices for the purpose of establishing regulations to ensure the responsible and sustainable development of onshore natural gas in the Province of Nova Scotia. The Province is interested in hearing from interested stakeholders who have concerns about the development of onshore natural gas resources in the province and will seek input from experts on the issues identified.

CAPP and CSUG engage in dialogue with governments, industry and the general public to enhance the economic sustainability of the natural gas industry and promote a business and regulatory framework that acts in the public interest.

The natural gas industry in Canada has a long history of responsible development of Canada’s natural gas resources. Throughout this developmental history, industry practices and associated regulations have evolved which:

- protect the environment,
- effectively conserve resources,
- allow economic development, and
- protect public health and safety.

We fully support regulation that meets these objectives.

The stability and predictability of the policy and regulatory system in any jurisdiction is a key consideration for investors. The Nova Scotia Government is acutely aware of this through its
experience in attracting investors to develop its offshore natural gas resources. It is important that Nova Scotia develop a regulatory system for its onshore natural gas resources that is competitive so as to encourage investment, while ensuring responsible environmental and social outcomes.

There are local environmental and social implications arising from any form of industrial development, natural gas included. These may be seen as more acute in cases where there is no prior experience with activity of this nature. However, industry, policy makers and regulators have a well-established track record in successfully mitigating these issues in many other Canadian jurisdictions. At the same time, there are local benefits (employment, tax revenue, provision of goods and services, etc.) that are derived from natural gas activity. Regulators must also take into consideration other broader public interests, the latter of which, in the case of natural gas, includes economic benefits, energy security and reliability benefits and the opportunity to expand the supply of a lower carbon fuel.

Development of natural gas will require a balance between energy needs, the economy and environment. Nova Scotia should consider natural gas’ benefit as the cleanest turning fossil fuel, displacing higher emitting energy sources, when addressing environmental measurements as part of upstream environmental policy and regulations. This positive environmental effect is also relevant.

**Sustainable Development of Nova Scotia’s Onshore Natural Gas Resources**

The sustainability of development of Nova Scotia’s onshore natural gas resources is reliant on a robust and efficient regulatory framework and the commitment of industry to advance technology and operating practices to improve environmental and safety performance. Existing producing jurisdictions in Canada have successfully maintained the social license to operate in an environment of increasing stakeholder expectations.

Broadly, there are several areas where industry, government and regulators must focus to ensure that natural gas resources are developed responsibly:

1. **Stakeholder Consultation.**
   Industry works closely with stakeholders to analyze, monitor, and address the consequences of its activities. As an example in the Western Canadian provinces of Alberta and British Columbia, there are industry regulations and best practices to conduct consultations with landowners and occupants and other stakeholders before projects are undertaken. In Alberta, any affected stakeholder may voice concerns about a proposed project and there are regulatory requirements of industry to deal with such concerns as a pre-requisite to project approval.

2. **Ground Water Protection.**
   Protection of Nova Scotia’s groundwater resources is of paramount importance to the natural gas industry. This sentiment is equally evident in all areas of natural gas development in Canada. There are strict industry regulations and practices relating to the drilling and construction of natural gas wells to ensure that deep gas bearing zones have no adverse contact with shallow potable water resources.
These practices include the installation and cementing of steel casing, usually two layers of casing and cement, to isolate shallow water zones from deeper onshore natural gas zones. All future operations in natural gas wells take place inside this casing which is strong enough to contain the anticipated pressures from any future operations which would be contemplated.

Hydraulic fracturing is a proven technology that has been used to safely access oil and natural gas reserves across the world for more than 60 years and is an essential process to release natural gas from the onshore natural deposits in which it is stored. Worldwide, hydraulic fracturing is now the most widely used and successful stimulation technique and is usually applied to wells drilled in low permeability reservoirs in order to increase the production rate. Without horizontal drilling and hydraulic fracturing, it would be impossible to produce significant quantities of gas from most onshore resources.

Hydraulic fracturing of onshore natural gas zones which are hundreds and even thousands of meters deeper than shallow potable water bearing zones has been shown, through the use of micro-seismic monitoring, to not extend upwards into any sources of potable groundwater. Furthermore, there has been no evidence in the history of hydraulic fracturing to indicate that such upward migration can happen over a long period of time.

In western Canada, hydraulic fracturing has been conducted in tens of thousands of wells with very, very few negative incidents. To the extent that incidents have occurred, they are almost always related to well construction issues where there is a loss of wellbore integrity causing fluids to migrate from one geological zone to another. In such wellbore construction circumstances, companies are required, by regulation, to undertake necessary repairs. A combination of sound industry practices and industry regulation has made hydraulic fracturing a very safe procedure used in the recovery of natural gas from onshore natural deposits. Attachment 1 provides additional information on hydraulic fracturing processes and related technologies.

3. Land Use

Industry best practices call for land-use practices that integrate environmental, low-impact techniques, species conservation and biodiversity considerations in the planning and development of Canada’s natural gas resources. Canada’s thorough and longstanding regulatory system for energy development, combined with industry best practices, ensure that land is returned to an acceptable state after use. Advancements in resource finding and extraction technology help reduce the natural gas industry’s environmental footprint on the land, especially for the production of Canada’s abundant supply of unconventional natural gas.

Additionally, natural gas companies are also changing from a well-by-well approach to a project- or area-based planning approach. By working in this way, companies improve operational efficiency and streamline industrial activities in an area. An example of companies working together to manage development is
the Horn River Basin Producers Group. Eleven oil and gas companies currently developing in the Horn River Basin in British Columbia have come together to ensure that this area is responsibly developed, and that cumulative impacts on the land are minimized. The group works together to coordinate access and infrastructure development, to collaborate on research and to share information.

The natural gas industry is continually assessing its land-use practices and adopting new technologies to improve the efficiency and effectiveness of its work. Industry is always moving toward new ways of exploring for natural gas that lessens the environmental footprint on the land.

4. Stewardship of Fresh Water Resources
   In addition to the protection of groundwater resources, the industry is also cognizant of the intensity of use of fresh water in natural gas development. Both operators and service companies are evaluating and progressively implementing new water management strategies in recognition of water use and waste water disposal needs for some types of onshore natural gas development. These strategies include the use of non-potable groundwater water instead of potable water, the recycling of used frac fluids and produced water to reduce the use of potable water and in some situations the use of fluids other than water in the hydraulic fracturing process. In most cases it is not practical to implement these strategies during testing and evaluation or pilot stages of natural gas development; however, commercial resource development brings economies of scale that improve the potential for application of water treatment, desalination, and re-use of water.

Onshore Natural Gas Development: Economic Opportunity for Nova Scotia

The oil and gas sector in Canada is a vital part of the economy, both nationally and regionally. It is a key component of Canada’s energy system, critical to the security and reliable access to energy supply by all Canadians. Crude oil and natural gas and their by-products are enmeshed in every aspect of our lives. The sector and supply chain employs Canadians in every part of the country, offering highly-skilled and well-rewarded employment. It has been estimated that, for every $1 of investment in the oil and gas industry, $3 dollars of economic benefit is realized in the form of direct (natural gas development industry), indirect (supply and services industry) and induced (restaurants, hotels, retail, etc.) impacts. The emergence of a successful natural gas industry onshore in Nova Scotia affords the Province with the opportunity to bring these benefits to its citizens.

Furthermore, the oil and natural gas industry is a significant source for revenues for governments. In 2010, payments to governments in Canada at all levels was $19 billion.

Competitive Challenges to Onshore Natural Gas Development in Nova Scotia

Underlying these economic opportunities, however, is the increasingly competitive nature of natural gas development in North America. The emergence of huge onshore natural gas plays in
the United States and western Canada has afforded a great deal of optionality in capital markets. Investment opportunities in Nova Scotia, and, indeed, in the rest of Canada, must be very cognizant of the competition amongst natural gas investment opportunities. Competition is forcing investors to scrutinize opportunities more closely on all factors bearing on rate and risk of return, including above-ground risks. Competitiveness in the initial exploration and evaluation phase is critical in increasing industry's interest in a particular play and is paramount in creating opportunities for any jurisdiction. The regulatory framework must work for investors.

**Regulatory Stability and Competitiveness**

The stability and predictability of the policy and regulatory system in any jurisdiction is a key consideration for investors. It is important that Nova Scotia develop a regulatory system for development of its onshore natural gas that is competitive so as to encourage investment, while ensuring responsible environmental and social outcomes.

The competitiveness of a regulatory regime is largely influenced by the following factors:

- **Jurisdictional Arrangements and Coordination**
  Effective coordination within government (i.e., across government departments and regulators) and between governments (i.e., between the federal and provincial governments) is critical if sound policy and regulatory decisions are to be produced in a timely manner without compromising Nova Scotia's investment competitiveness or environmental and social performance expectations.

- **Regulatory Process Performance**
  A critical determinant of competitiveness is the time lapse between exploration success and commercial production. This applies, not only to large complex projects, but also to medium and smaller projects which are very sensitive to incremental costs and delays arising from inefficiencies in the regulatory review process.

- **Regulatory Complexity**
  In other producing jurisdictions in Canada, regulatory complexity has arisen from new laws of general application, largely aimed at improving environmental performance, which have overlain the oil and gas regulatory regime with new requirements and restrictions. Associated administrative and regulatory processes have impacted business practices, reducing competitive advantage and eroding the viability of projects. Access to lands has also been restricted as a consequence of policy or planning that does not take into account resource interests and investment implications. Greater coherence is needed between environmental policy and the realities of the business decisions required to maintain a competitive Nova Scotia natural gas industry. It is this balance that will provide the opportunity to realize the economic benefits of the emerging natural gas industry in Nova Scotia while protecting the environment, addressing social impacts and protecting public safety.

We have included in this submission a synopsis of British Columbia's recent experience in reviewing its regulatory framework. This is often cited as an example of the necessity to keep industry regulations competitive while at the same time enhancing environmental performance,
increasing industry development activity, and responding to ongoing changes in industry practices and technology. (See Attachment 2).

**Regulatory Enhancement**

CAPP understands that the Province of Nova Scotia is studying other regulatory regimes to determine best practices for implementation in Nova Scotia.

Alberta and BC have established regulations that have been tested by natural gas resource play development. Regulations in both provinces have addressed onshore natural gas exploration, evaluation, and development activities. Efforts by both industry and government on an ongoing basis seek to identify and capture opportunities to reduce industry impacts and improve regulatory efficiency while providing for sustainable development in the public interest.

All three western Canadian provinces have many years of experience and success in forming a regulatory framework which serves to protect the environment, ensuring the safety of the general public and its industry workforce while allowing the economic development of natural gas resources for the public good. These three jurisdictions have a high level of regulatory harmonization which allows exploration companies to efficiently dispose services, maximizing the economic competitiveness in all areas.

In recent years BC has moved substantially toward a single regulatory body to approve and provide oversight of exploration and production activities. Alberta is undertaking a broad review of its regulatory framework for the oil and gas industry, and is considering a variety of options including a move toward a single regulator. BC and Alberta both regularly review the appropriateness of regulations and amend or change to reflect new resource types, technology, and industry practices.

**Summary and Recommendations:**

The Province of Nova Scotia can benefit from the established and proven regulatory approach and requirements in Western Canada related to unconventional onshore natural gas exploration and development. This provides the opportunity for Nova Scotia to develop a modern regulatory framework that acts in the public interest, ensures protection of the environment, and leads to a sustainable onshore natural gas industry.

CAPP and CSUG, therefore make the following recommendations for the Province's consideration:

1. Changes to the regulatory oversight of the natural gas industry in Nova Scotia should meet several important criteria:
   - protection of the environment,
   - effective resource conservation,
   - permit economic development, and
   - protection of public health and safety.
The stability and predictability of the policy and regulatory system in any jurisdiction is a key consideration for investors. It is important that Nova Scotia develop a regulatory system for natural gas that is competitive so as to encourage investment, while ensuring responsible environmental and social outcomes.

2. Where changes to, or implementation of, new regulations is necessary to provide oversight to Nova Scotia’s onshore natural gas industry, strive to streamline and align with the existing frameworks of existing gas producing jurisdictions in Canada, particularly Alberta and B.C.

The three western Canadian provinces have many years of experience and success in developing and implementing a regulatory framework which protects the environment and ensures the safety of the general public and its industry workforce, while encouraging the economic development of natural gas resources in the broader public interest. These three jurisdictions have a high level of regulatory harmonization, which allows industry to efficiently conduct its activities, thereby enhancing economic competitiveness in all areas.

Additionally, the Canadian natural gas industry has established a long history of sound practices which are designed to protect human health and safety as well as the environment.

With the benefit of these learnings and a progressive approach to regulation of the emerging onshore natural gas industry in Nova Scotia, CAPP and CSUG are of the view that Nova Scotia’s onshore natural gas resources can be developed in a manner that concurrently advances environmental performance, economic growth and energy security and reliability.
Canadian Natural Gas

Unconventional Gas and Reservoir Stimulation Technologies
Unconventional Gas and Reservoir Stimulation Technologies
What is Unconventional Gas?

The term "unconventional gas" refers to the types of reservoirs where the gas is found, and in some cases the mechanism of storage. In an underground reservoir, the three most common types of unconventional natural gas are:

- **Shale Gas**: found in extremely fine-grained, essentially impermeable sedimentary rocks, requiring complete reservoir stimulation to help the natural gas flow.

- **Tight Gas**: found in the pore space of sedimentary rocks that have very low permeability. Reservoir stimulation is required to recover tight gas resources.

- **Coal Bed Methane (CBM)**: formed during the process of coalification. In this process, methane is generated and trapped as peat turns into lignite and later into coal, in coal seams. Methane is primarily stored by adsorption on solid hydrocarbon molecules.
Reservoir stimulation methods are used to recover the resource.

The traditional way to produce conventional natural gas is by drilling a well that taps into rocks in the subsurface, where gas is stored under compression in the pores of a permeable rock. This gas is easily produced. However, natural gas also occurs in abundance in less permeable geological formations, where the gas is trapped much more tightly within the rock. These widespread gas fields are found in several regions in Canada and form the basis of the country's conventional gas industry.

A Wellspring of Innovation

Releasing the gas from these formations is the goal of unconventional gas production. In the matter of unconventional gas resources, they are not limited to a single type of rock formation. Geological characteristics and rock types vary, resulting in a unique set of characteristics at different locations. Each location requires site-specific techniques to extract the resource, and each gas well requires careful analysis to match the well's parameters with the methods used.

With the underground target in mind, each surface location must be surveyed and assessed with care at every stage of development. Through full evaluation, engineers and scientists are able to determine the most suitable well-drilling techniques. The terrain, environment, water resource, and reservoir structure are all considered.
of the surrounding area is rarely evaluated. Then, moving deep underground, the rock types and distribution, and subsurface structures are studied.

With so many factors at play, there are dozens of combinations of inherent conditions and operator's choices to design a well. It is often necessary to employ reservoir stimulation techniques, often referred to as fracturing or fracing, where the rockholding then natural gas is fractured, much like in safety glass being shattered. By using new combinations of these techniques, customizing them for each well, that may include horizontal drilling and multistage reservoir stimulations, natural gas producers can access natural gas found within a variety of challenging geological formations.

Drilling

Advances in horizontal drilling have extended the datarath of horizonan wells and broadened the scope of application of horizontal drilling. The turning radius from the vertical wellbore to the horizontal leg continues to be a constraint at shallower depths, generally limiting use of this drilling technique for deeper reservoirs. Nonetheless, horizontal wellbore rath B\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\n\\nmany wells can be drilled fromn a single surface location than multi-wellrath. Multi-wellraths offer a significantly smaller footprint than multiple vertical wells. The associated reduction inn surface forecast, and the corresponding reduction inn habitat fragmentation.
Fracturing

Hydraulic fracturing, then process of inducing fractures in reservoirs, has been a key technique in the development of unconventional oil and gas fields. The technique involves the injection of a fluid (typically a suspension of proppant) down a wellbore to create fractures that allow for the production of oil and gas.

Advancements in hydraulic fracturing techniques have led to an increase in productivity of unconventional reservoirs. The use of advanced equipment and materials has made the process more efficient and cost-effective. The development of new well designs and the incorporation of induced seismicity monitoring have also contributed to the success of hydraulic fracturing.

In hydraulic fracturing, a high-pressure fluid is pumped into a wellbore to create fractures in the surrounding rock. These fractures increase the permeability of the reservoir, allowing for the more efficient extraction of oil and gas.

The combination of unconventional reservoirs with hydraulic fracturing has led to a significant increase in the production of oil and gas in many parts of the world. The technique has been particularly successful in the development of shale gas reservoirs, where the high porosity and permeability of the shale rock make it an ideal target for hydraulic fracturing.

In addition to traditional hydraulic fracturing, there are also emerging techniques that involve the injection of gels, foams, or other substances to create fractures. These techniques are being explored as a way to improve the efficiency and effectiveness of hydraulic fracturing.

The future of hydraulic fracturing is likely to involve continued development of new techniques and technologies, as well as a greater focus on sustainability and environmental considerations.
monitoring risks employed on detecting extremely small ground movements in deep broken subsurface, identifying the orientation and complexity of fracturing generated by the operation. Importantly, the technique also identifies both the lateral and vertical extent of the induced fracture. When applied during hydraulic fracturing operations, microseismic monitoring allows modelling to optimize the orientation and spacing of future wells, and the optimal number and spacing of hydraulic fracturing stages in the horizontal well. Detailed production testing enables the identification of areas where rock was successfully fractured and areas where fracturing was inadequate or where hydraulic fracturing fluids did not flow back to the well, remaining in the reservoir and inhibiting production.

In some places and for some resources, unconventional gas development can require large quantities of water. In situations where natural gas and other unconventional resources are accessible, the application of horizontal drilling and hydraulic fracturing techniques are necessary. These regulations are administered by the number of government ministries, including environment, natural resources, energy, and others. In addition, major producing jurisdictions have implemented various regulations to protect the environment.

In some reservoirs, fracturing is the most water-intensive activity associated with natural gas production. There are various techniques for increasing the efficiency of hydraulic fracturing operations, reducing the impact on surface water and aquifers.
Multiple Stage Hydraulic Fracturing Operation Underway

In some shale development areas, the length of horizontal laterals and the number of fracturing stages are increasing. This has the effect of increasing the amount of water used per fracture stage per well, but is offset by the increased volume of the resource that is ultimately recovered per well. This reduces the number of wells and well pads that would otherwise be required.

Production Operations at a Multi-Well Pad
Common Fracturing Techniques

<table>
<thead>
<tr>
<th>Name</th>
<th>Technique</th>
<th>Pros and Cons</th>
</tr>
</thead>
</table>
| Frac-Through-Collar (FTC)   | Steel coiled tubing is fed into the wellhead from a specialized unit. At the bottom of the coiled tubing, a set of tools isolates the targeted zone from the rest of the well, and allows the slurry to be placed into the targeted zone. The operator on surface raises and lowers the coiled tubing as needed, usually working from the bottom of the well and moving upwards. | • Coiled tubing units can stimulate multiple isolated zones  
• There is a decrease of time on location, and a smaller footprint in comparison to larger frac trucks that require more equipment  
• Requires fewer employees to operate  
• Pumping rate is limited due to frictional flow (length) of coil is highly variable reflecting local conditions  
• Increased equipment costs |
| Abrasive Jet Multi Stage Fracturing | A unique coiled tubing approach that combines isolation and perforating into one tool. This coiled tubing-deployed bottom hole assembly (BHA) incorporates an abrasive jet perforating nozzle and an isolation technique - multi-setting bridge plugs or sand plugs. | • Combines many technologies to speed up completion of the well and to reduce costs  
• It also reduces the amount of services needed for the well which decreases the environmental impact around the wellhead  
• Patent limitations and licensing costs  
• Limited pumping rates due to coiled tubing and pipe configurations  
• High utilization of coiled tubing and associated costs |
| Multi-Stage Packers         | Holes are preformed for treatment. After the firstzone is treated, aballpopp is launched into the well, pushed by the frac fluid. This object seats on a frac port to both isolate the firstzone and open the second zone. This process is repeated on each zone. Once all zones have been fraced, the balls are pulled out to open the ports for production. | • The use of this treatment allows for multiple zones to be treated, with specialized programs for each zone  
• Initial cost for isolation packers is high, if issues occur while placing tools some, or all, of the well may be lost  
• Post treatment milling of balls and packers is costly and time consuming  
• Balls and data can get caught and zones may be lost, unable to properly complete the well  
• Delay from stimulation to milling can locally damage the reservoir making production difficult |
| Plug and Perm                | The deepest set of perforations in a well are stimulated, then a bridge plug is set to isolate the zone. A second set of perforations can then be introduced and fractured. The bridge plugs are removed when all fracturing is complete. | • The process can repeat itself for many times as needed to cover the zone of interest  
• This process is slow and multiple services are needed sequentially to ensure smooth operation  
• Long standing history of process  
• Variable distance from wellhead is limited  
• Increased delay from stimulation to production may reduce well productivity |
| Chemical Treatments         | Acidic acid (typically with a diluted solution of hydrochloric acid) is used as a fracture treatment, pre-treatment prior to a fracture and/or as general maintenance measure to clean a wellbore. | • In many fracturing operations a relatively small volume of acid is pumped ahead of the frac slurry as a "precoat" to improve communication with the formation prior to the fracture  
• Long standing common practice  
• Reduces pressure required to fracture the formation, and increases production by removing scale deposits |

Add Treatments
**GAS TREATMENTS**

**High Rate Nitrogen**
- Nitrogen gas is pumped into a formation at high rates and pressures. Used for shallow application, typically coated methane (CBM). Occasionally a small amount of sand proppant is added to the nitrogen, in essence creating a high-powered sand blast. Nitrogen is commonly used as an energy source additive for fracturing fluids.
- Opens veins, or natural fractures, in the coal and removes damaged areas in order for natural gas to flow more easily into the well.
- No fluids are added to this system; therefore no added chemicals are introduced into the formation
- High Rate Nitrogen is limited in its ability to stimulate.
- Energy is unable to transfer very far from the near-wellbore area.

**Liquid CO2**
- Pure Liquid Carbon Dioxide (CO2) is pumped into the wellbore.
- Commonly used as an energy source additive for fracturing fluids (shakes a pop can).
- No added chemicals are required.
- Most CO2 fracture treatments are done for research and development because CO2 is considered to be a low-damaging fluid in terms of its impact on the rock.
- Liquid CO2 is limited in its ability to suspend a proppant and has limited potential for commercial natural gas production.

**liquids & proppants**

The slurries (fluids) used in unconventional natural gas extraction are mixtures of liquids and proppants. In hydraulic fracturing operations, the objective is to create a liquid suspension of proppant that can be pumped at high pressure into the wellbore. The liquid is usually then rheologically manipulated to recover from the well, while leaving behind the proppant to increase the permeability of the rock.

Once the treatment is complete, any fluid in the well is pumped out, and the fluid is collected and taken to a processing plant. No fluid is left behind at the location; it is all carried away and processed, recycled or properly disposed of.

**Fluids**

Water is the basis for most hydraulic fracturing. Water sources may include recycled fracturing fluids, produced water from other oilfield operations, or brackish (salty) water that is drawn from below with a water table, but the most common resource today is surface freshwater. Water may be pumped as an emulsion with methanol from water-sensitive rocks. Recently, there has been a huge increase in the use of recycled fracturing fluids in North America, with many of the fracturing fluids being re-used.

**Additives**

To enhance the performance of the fracturing operation, various additives can be blended with the fracturing fluid.
**Pro-Fracs**

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**By-Peg**

- Gelatin or gelling agents: increase viscosity, propellant suspension and provide lubrication.
- Guar Gum (most common gellan to use): Guar bean, grown in India and Pakistan. Used as a food additive.
- Polycrylamide: Chemically produced long-chain molecule known as a polymer. Commonly used in water treatment as a flocculant, or for products such as soft contact lenses.
- Crosslinkers: used in small quantities to join polymers in a three-dimensional shape.
- Boron, silicon, titanium, or iron: Naturally occurring elements, mined at various locations.
- Clay and salt: used in water sensitive formations to prevent clay swelling.
- Potassium Chloride: Potash, used in the preparation of many types of fertilizer. Potassium chloride is used occasionally as a table salt substitute.
- Breakers: Breaks the polymer chain created by the gelling agent.
- Buffers: Manufactured substances that release oxygen.
- Surfactants: lower the surface tension on the fracturing fluid.
- Natrium: a naturally occurring agricultural by-product.
- Foams: A combination of water and air.
- Inhibitors: Prevent the introduction of bacteria in the formation fluid.
- Natural and manufactured biocides: Can be derived from bacteria or plants, or prepared from chemicals. Biocides are used in pesticides, antibacterial cleaners. Many companies are evaluating alternatives including ultraviolet light.
- Enzymes: Used to degrade or foam fluid for fracturing treatments.
- Carbon Dioxide (CO2): Common element found in the atmosphere. Carbon Dioxide can exist as a liquid, gas or solid, (known as dry ice).
- Nitrogen (N2): A naturally occurring element, nitrogen is stored, transported and pumped as a cryogenic liquid, then heated and injected into the wellbore as a gas.

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**Pre-Fracs**

- Guar Gum: Creates a natural polymer chain. Can be refined multiple times to improve its qualities such as methanol tolerance, decreased hydration time, and increased viscosity.
- Used to make water slippery for slickwater fracturing.
- Increases the viscosity of the liquid by linking the polymers.
- Reduces damage to reservoirs by inhibiting the reaction of certain chemicals with water.
Guar Beans – source of the most common additive.

Proppants
Commonly-used proppants include sand, ceramic, and resin-coated sands. Many different proppants have been used in the past, including walnut shells and glass beads.

A wide variety of proppants are available for modern hydraulic fracturing operations.

Sand is the most common proppant used in hydraulic fracture treatments. Sand must meet industry specification (API) and is sourced both locally and imported from the United States.

Ceramic proppants are manufactured as an alternative to sand. This type of proppant tends to be stronger and more crush resistant than natural sand. Generally, these are manufactured from fired clay.

Resin-coated sands are starchy, which reduces proppant flowback when the fluids are withdrawn from the wellbore.

Resin-coated proppants are usually pumped in small quantities at the end of jobs. An chemical activator is sometimes pumped with resin-coated proppant to enhance the sticky qualities of the resin.
How Fluids Work: A Close Look

When heavy equipment is used to actuate the arm of the forklift truck carrying the hay, these forks are moved to lift hydraulic fluid being pushed through hoses to cylinders by the arm's force and drive these to lower the bales of hay. The fluid is displaced under pressure through the steel plumbing in the production and casing to push against the rock formations hundreds to thousands of meters below the surface of the ground. In these cases, the pressure of the fluid is below the pressure rating of the plumbing in the fluid cylinders that extend or retract depending on the desired effect. The flow of the hydraulic fluid moves from a high-pressure area of flow to an area of low pressure, redirecting the return flow in the plumbing and the valves along the return path. The pump must be able to exert more pressure into the fluid than the forces exerted by the metal frame and raising the actuating arms.

Hydraulic fracturing uses fluid under pressure to push water through the pipe. Why? Water is used to grab onto the plumbing and push rock against the pumps. This friction causes the pump to work harder, meaning the working pressures are higher and then amount of energy. horse power, and fuel needed to do the work is greater. In order for a work site to be further away from the surface, the characteristics of water must be changed, allowing for efficient work, and this is done with additives.

Water by itself cannot move sand and otherprops. It needs help from gravity and large volumes of water to be effective. A low head build up speed is needed to pick up rocks and material in particles and move them down river. It is only when water reaches transportor at the particles that the fluid becomes a flow rate necessary for exchange. It is not necessary to change water characteristics and make it thicker to better carry or hold up particles.
Guar flour, commonly used in many households for making noodles, has the attribute of making water thick and slippery. If guar flour is added to water in hydraulic fracturing fluid, only a few grams of the guar flour will thicken the fluid, making it more slipperier. The slipperiness allows the fluid to slide more easily through the rough steel pipe and makes the thicker fluid increase the water's ability to carry particles, such as sand.

Another important aspect is to maintain the stability and physical constitution of the rock and clay that holds the natural gas. To ensure that the clay materials do not react by pulling the water molecules onto themselves and weakening the rock, the hydraulic fluid has pushed into the rock formation. Scientists have studied the reactions of clay minerals that may have present in the rock zone of interest. By using the additives, not only potassium nitrates in the water but also clay-water reactions, allowing the water to move past the clay particles without any effect to the rock formation.

The proppant, a material that is added to the hydraulic fracturing fluid, is designed to prevent the closure of the cracks created when the hydraulic fluid is pushed into the rock. The proppant spaces the fracture passages that are not propped open and allows flow.

So far, three additives, guar flour, potassium nitrates, and proppant have been added to water in hydraulic fracturing to change its characteristics. Sorbitol is a thickener that can carry and proppant through the steel plumbing system into areas of interest without changing the formation's chemistry. Known that there are cracks filled with proppant and fluid, the fluid must get around it, allowing hydrocarbons to flow. The permeability is increased by the fluid flow, allowing the reservoir to produce more.
chain changes the starch so that it loses many of its original characteristics including its solubility to the common sugar chains. Enzymes are naturally occurring enzymes that break down sugar chains. When a fracturing fluid is used as an additive in hydraulic fracturing fluids, it is often treated with a chemical that reduces the thickness of the fluid. This reduces the amount of additives required, which results in a thinner fluid that is easier to control and inject. When this occurs, the water follows the steel production plumbing back to the surface whenever the pump pressure is released.

The breaker enzyme is acid-activated and is used in specific conditions to remain active in brines. Food, the guar gum, and the fluid form the gassnernorn, and the environment affects its survival. Several conditions must be met to ensure that the enzyme works. These conditions are: the right temperature, the right pH, and the right conditions. The breaker breaks down the thickness of the fluid, prior to deteriorating the job. If the breaker is not added to the fluid, the water in the formation will not flow back to the surface.

To enhance fluid flow, the surface tension is reduced by using soap or another surfactant. When soap is added to the fracturing fluid, it increases the fluid's density, which reduces the effect of the fluid's surface tension. This results in a thinner fluid that is easier to control.

When the fracturing fluid contains additives to thicken the fluid, they can reduce the amount of additives required. By reducing the amount of additives required, the fluid can be thinner and easier to control. This is one of the advantages of using additives in fracturing fluids.
required if the water is not used within that timeframe.

As with any process, science and technology drive innovation quickly. Many short-term technical innovations result in new designs that result in better and easier tools to address human interests. Similarly, the hydraulic fracturing industry has also pushed to advance technology and reach service companies that were sciences and chemical suppliers to develop leading-edge fluids to meet operator and public demands. Because of the intense competition between companies, fluid systems are trade secrets.

To summarize, hydraulic fracturing fluids need to have unique characteristics so they can travel in multiple kilometres from surface into the reservoir while retaining their core properties, and within a short time change back into water for the return multiple kilometres trip on the surface. They commonly contain minor or more combination of: Water, thickener, anti-friction reducer, clay swellling suppressant, breaker, water friction reducer, bubble maker, water reducing support agent, thickening and more n clay control, gas, bug and bacteria killer and commonly some sort of proppant, usually sand.

The Regulatory environment

Whatever the methods chosen for the production of natural gas, stringent and long-standing regulations govern both conventional and unconventional natural gas development in Canada. The industry is committed to the environment a responsibility that health and safety, and sustainability. The industry continues to work with regulators and policymakers to ensure that all developments are conducted in an appropriate manner.

In Canada when companies wish to transport chemicals or goods from their base of operations to another location, they require a permit to follow regulations that govern these activities. The purpose of federal transportation of dangerous goods (TDG) Act and related regulations is to promote and ensure public safety, and the transportation of all persons who handle, offer for transport, or transport dangerous goods by any means.

These rules are reinforced and monitored by inspectors and have monetary and regulatory penalties associated with them. These penalties are applicable to all persons responsible for the violation of these regulations. According to the regulations, all persons who handle or transport goods must be trained and certified, and the certification must be renewed every three years.
Each person who takes the training is issued a copy of the regulations and is expected to retain the document at all times as they work with their duties. If the RIG regulations are complemented by the nationwide communication system, W/HMIS (Workplace Hazardous Materials Information System), which supports the safe use, handling, and storage of products within the workplace.

All employees are required to develop and implement a plan to communicate hazardous materials used in the workplace. The plan should support the regulations and ensure that workers are aware of the regulations and are required to follow the rules set out by the federal government.

In addition to these regulations, the government of Canada plays a significant role in protecting human health and in the environment from the risks of substances under section 11 of the Canadian Environmental Protection Act, 1999 (CEPA 1999). For instance, scientists at Health Canada, under Environment Canada assess chemicals and substances to determine if they pose a risk to human health and the environment.

All additives that are used in hydraulic fracturing fall under these regulations and are strictly adhered to in all times. All staff and management from all of the service companies are aware of the regulations and are mandated to follow the rules set out by the federal government.

Two key programs by which the government of Canada manages substances are the

![Arco Logo](image-url)
Chemicals Management Plan and the New Substances Program. Substances for use in the oil and gas industry (e.g., lubricants, drilling fluids, corrosion inhibitors, surfactants, fracturing fluid additives, desulfurization agents, and bacteria control agents) are subject to these two programs.

The CEP Act 1999 provides for the regulations that are an integral part of the federal government’s national pollution prevention strategy. These regulations become complete management approaches for toxic substances and were created to ensure that new substances, including chemicals and polymers, are introduced before reassessment of whether they are potentially toxic has been completed, and any appropriate control measures have been taken.

More details on the programs and information on the regulations, research, and decisions that must be adhered to by the oil and gas industry, can be found on various government websites:

**Transportation of Dangerous Goods**
http://www.tc.gc.ca/eng/tdg/clea-remenu-497.htm

**Workplace Hazardous Materials Information System**

**Chemicals Management Plan:**
http://www.chemicsubstanceschi.miques.gc.ca/nd ex-eng.php

**New Substances Program:**
http://www.ec.gc.ca/subsnouvelle s-news/subs/default t.asp?lang=En&n=AB189605-1
Appendix

Endnotes

Attachment 2: BC Oil & Gas Commission Structural Reform

In the late 1990's, the Province of British Columbia identified it's regulatory systems as one of several key barriers to investment in the Province's oil and gas sector (BC Oil and Gas Initiative). The system at that time could be described as a multiple agency regulatory structure characterized by conflicting mandates, practices and duplicative decision making processes.

In May of 1998, the Government of British Columbia (GoBC) initiated the establishment of a new regulatory agency, the British Columbia Oil and Gas Commission (OGC), to consolidate oil and gas authorities with in one organization. The OGC was legislatively established through the Oil and Gas Commission Act (Act), July 30, 1998, which set out the purpose and mandate. The Act included a number of specified enactments that transferred responsibilities for oil and gas regulation from other BC Government Agencies (Ministry of Environment, B.C. Lands, Ministry of Forestry, Ministry of Energy, etc.) to the OGC. In practice, this allowed for a transfer of existing regulatory review processes and the people who had been administering them into one agency with a mandate for effective and efficient regulatory oversight of the Province's oil and gas resources.

The Act also established responsibility for consultation with Aboriginal with the OGC. The OGC administered this consultation process through a Memorandum of Understanding, which had been negotiated with Treaty Eight Aboriginal (MOU). The MOU established timelines and processes for consultation on OGC oil and gas applications and a process for providing financial capacity to Aboriginal signatories of the MOU to establish human and technical resources to manage consultation within their First Nation communities.

The OGC became operational in November of 1999, approximately 6 months after the decision to initiate a new regulatory framework by the GoBC (in advance of the winter drilling season in Northeast BC). The relatively short timeframe for legislatively and operationally establishing the OGC was made possible by the specified enactments that transferred authorities, human resources, systems and processes into this new structure.

Results of BC Regulatory Enhancement Initiative

The establishment of the OGC in conjunction with a more structured Aboriginal consultation process and enhancement to BC’s royalty system played a critical role in a significant increase in oil and gas investment in British Columbia in the last decade. While the decision to change the structural makeup of BC’s regulatory system through the establishment of the OGC contributed to a more consistent and predictable regulatory environment, it did not resolve numerous inefficiencies in the existing regulatory functional processes (authorizations, compliance, etc.) which were transferred through the specified enactments to the OGC. Like most oil and gas
regulatory agencies, the BC OGC has initiated ongoing business process improvements since its establishment in 1998.

As a result of this review, the Petroleum and Natural Gas Act was largely replaced with the Oil and Gas Activities Act. As outlined on the Oil and Gas Commission website, "The Oil and Gas Activities Act (OGAA) reflects a shift toward the future of oil and gas activity in British Columbia. Technological advances, interest in unconventional gas, and increased social and environmental expectations are driving the industry forward. In response, the province developed a new regulatory framework. A process that started with extensive consultations with communities, landowners, First Nations, environmental groups and industry ended with streamlined, enhanced legislation reflecting the needs of the people, environment, industry and government."

New regulations governing all oil and gas activity, including Consultation and Notification requirements for non aboriginal groups, environmental regulations, as well as regulations governing drilling and construction were implemented on October 4, 2010.
Dear Senior Technical and Policy Staff Team,

I live in Mount Hanley, Nova Scotia. Thank you for requesting comments on hydraulic fracturing. I am very concerned that 4 test wells have already been subjected to hydraulic fracturing in Hants County and that the province signed a production agreement in April 2009 with a company that specializes in hydraulic fracturing. That company, Elmworth Energy, is owned by Triangle Petroleum. Triangle state on their website that they hold the lease to 475,000 gross acres of our province.

My concerns are many, starting with the safety of our water supply. In the US, hydraulic fracturing has led to water wells being contaminated with methane and with chemicals used in 'fracking fluids.' In what is described as 'the most comprehensive national assessment to date of the types and volumes of chemical used in the hydraulic fracturing process', a report prepared for the US Democrats House committee on Energy and Commerce in April 2011, shows that between 2005 and 2009, the 14 leading hydraulic fracturing companies in the United States used over 2,500 hydraulic fracturing products containing 750 compounds. More than 650 of these products contained chemicals that are known or possible human carcinogens, regulated under the Safe Drinking Water Act, or listed as hazardous air pollutants. (p.12)

Hydraulic fracturing companies used 2-butoxyethanol (2-BE) as a foaming agent or surfactant in 126 products. According to EPA scientists, 2-BE is easily absorbed and rapidly distributed in humans following inhalation, ingestion, or dermal exposure. Studies have shown that exposure to 2-BE can cause hemolysis (destruction of red blood cells) and damage to the spleen, liver, and bone marrow. (p.7)

The hydraulic fracturing companies injected 21.9 million gallons of products containing 2-BE between 2005 and 2009. (...) EPA recently found this chemical in drinking water wells tested in Pavillion, Wyoming.' (p.7)


In Canada, Jessica Ernst is taking Encana, the Province of Alberta and their Energy Review Board to court for the contamination of her well water in Rosebud, Alberta following hydraulic fracturing of coal bed methane wells nearby. Coming still closer to home, we learned on 24th May that Southwestern Energy, a company intending to drill for natural gas using hydraulic fracturing techniques in New Brunswick, is the subject of a class-action lawsuits by residents of Arkansas whose wells have been contaminated. Residents of Pennsylvania are seeking damages from that company on similar grounds.
Hydraulic fracturing uses huge volumes of water. As an example, to frack one test well, Kennetcook #1, drilled in Hants County in August 2007, Triangle used 1.5 million gals of water. This was mixed with 960,000 tons of sand and an undisclosed quantity of chemicals. Usual industry practice would be for the volume of fracturing fluid to equal 0.5-2% of the water volume, so 7,500-30,000 gallons of chemicals. The chemical makeup of the fluid is not reported.

Hydraulic fracturing produces large volumes of waste water contaminated not only by the chemicals added to the water but by substances such as heavy metals found deep in the bedrock where the water is pumped to fracture the gas-bearing shale. This waste water poses a threat to surface water. In the US the New York Times has reported on major issues in Pennsylvania where Municipal Waste Treatment Facilities, which lack the means of testing for radioactivity, have been disposing of radioactive 'flow-back water' in rivers and streams.

Here in Nova Scotia we have arsenic and uranium in the bedrock in many parts of the province including areas of the Maritime Sedimentary Basin where shale gas is also to be found. Kennetcook #1 was drilled 1358m deep. The company retrieved 66% of the water from this well plus chemicals and, quite probably, radioactive material. That one million gallons was disposed of somewhere. Does the sole Hants county Municipal Waste Treatment facility even test for radioactivity in waste water?

Then there's the half a million gallons of water and chemicals that remained in the ground. While the well was deep, it is in the nature of fracturing that the impervious shale is cracked. It is extremely difficult to know where those chemicals will migrate to. In addition the methane released from the shale travels along the fractures in unpredictable ways. The Bay of Fundy as well as the Kennetcook and Walton rivers are nearby. The Inner Bay of Fundy Atlantic salmon that spawn in those rivers are an endangered species.

Given the level of threat hydraulic fracturing poses to our most precious and irreplaceable resource, fresh water, a review of the sort currently being conducted in Nova Scotia is inadequate. We need a comprehensive Strategic Environmental Assessment. This should offer public meetings around the province for citizens to learn and express their concerns about hydraulic fracturing. Such a review should consider the environmental, economic and social consequences of hydraulic fracturing, including its impact on the tourism industry.

Hydraulic fracturing results in the industrialization of rural landscapes. In the production lease application that was approved by the province in 2009, Triangle's vision for the Windsor Block included drilling up to 100 wells the first year then 80 wells per year for 7 years. That means over 600 wells plus pipelines, separators, storage tanks and processing plants. There would need to be a processing plant with a compressor every 5 square miles.

All this construction would create some jobs but the benefit would be short-lived. In its production lease application, Triangle anticipates a 50% depletion rates for its wells by
the end of the first year of production with a further 50% depletion each year after that until the fifth year when the depletion rate levels out to 10% a year. Even this steep decline in production may be over-optimistic. In the US a 75% drop in production by the end of the first year is apparently common. Given the royalty holiday the province currently offers for the first two years of production, it seems unlikely that Nova Scotians will benefit even in purely fiscal terms. Certainly we will not benefit from the environmental devastation we will be left with when the energy companies have shuttered the wells, declaring them no longer economical.

As to the industry's claims that the natural gas they produce through hydraulic fracturing is a clean fuel, a way to reduce our greenhouse gases while we transition to renewable energy sources, a recent study by scientists at Cornell found that, when methane leakage from well casings and other sources of contamination are taken into account, hydraulically fractured natural gas is as dirty as dirty old coal. Far from reducing our greenhouse gases, it is to conventional gas as tar sands oil is to conventional oil: a particularly dirty form of an already polluting fossil fuel.

In the light of all this, the question under review must not be how to regulate hydraulic fracturing but whether the practice should be permitted at all in Nova Scotia. The governments of France and South Africa have banned the practice as being too risky. We need a complete moratorium on all hydraulic fracturing in Nova Scotia, whether for exploration or production, until a comprehensive Strategic Environmental Review has been conducted and has found that hydraulic fracturing can be done safely and is worth doing.

The Minister of Energy wrote recently, in response to concerns expressed about fracking, "I can assure all Nova Scotians that if a proposed activity has not demonstrated that it can be done right, it will not be approved." I very much hope that he lives up to his word and that the NDP government shows the leadership in environmental matters that so many of us hoped for when we gave it a majority in this province.

85. This is a duplicate of an email submission sent in late May.
From: "David Ross"
To: <frac-review@gov.ns.ca>
Date: 6/7/2011 7:48 PM
Subject: Draft Scope of Review of hydraulic fracturing in shale gas operations in Nova Scotia

Your draft scope does not include the geological and seismic effects of fracturing the underground rock layers.

David Ross
Re: Oil & Gas Drilling & Fracking in N.S.

June 6, 2011

Dear Team of Senior Technical and Policy Staff,

The time for 'review' on hydraulic fracturing is long past. The Nova Scotia government needs to step up to the plate and ban hydraulic fracturing (aka fracking), a technique used to extract natural gas. Governments in other jurisdictions have already moved to do this, or have done so already. There is no reason to do your own review except to stall the process while oil and gas companies further get their feet in the door.

The oil and gas industry already has itself solidly planted in areas where it has no business being: universities in Nova Scotia, departments of Fisheries, Natural Resources, and Energy. I am shocked that an NDP government, who federally has lauded themselves as the environmental 'party' seems to be quite happy to encourage oil and gas – and in places that it has no business existing – instead of investing in green energy and the future of the people in this beautiful land of Nova Scotia.

And who will pay the price for fracking. The regular people Nova Scotia and those of us who have land there. Certainly not the very comfortable execs of Petroworth and their Board in Ontario. the environment that we drink, eat, and breathe. Fracking poses serious risks to the environment – which is the very water we drink, the food we eat, and this toxic soup of chemicals shot into the bowels of the land there. should not be allowed to occur in Nova Scotia or anywhere.

My land on the Lake is heritage land, in my family for nearly 200 years. We are talking about a Lake that feeds the Heritage River, Margaree – home to Nova Scotia's salmon fishing tourism. Lake Ainslie is surrounded by forest and fields and is the largest lake in the Maritimes – and this is where you would even consider such a travesty to take place? This is an area that is growing in tourism. This is an area that the Ministry of Natural Resources wanted to buy from us 25 years ago to protect the spawning Gaspereau in our part of the Lake. I have the letter and will produce it, when the time is necessary!

This is an area of nesting bald eagles.

The road along the lake is already in dire shape and you want big trucks up and down it day and night? Who is paying for the repairs and damage? I don't! I already pay enough in taxes. Is the Department of Energy going to pay for it – and then it can increase my taxes?

No one will benefit from this except a few people in high places – not the locals and not the landowners – not when there is so much to lose.

In closing, here is a link to Petroworth's own website http://www.petroworth.com – which gives NO ASSURANCE to people wishing to invest, that there money is safe, including the words "risks associated
with oil and gas exploration*. However, they are willing to tell us that their procedures (and thus our very lives) are safe?

How would you feel if this was YOUR own beautiful backyard? Do the right thing – say no to fracking. Here’s a link to a picture of Lake Ainslie our beautiful backyard, another picture and site which documents rare plants and abundant wildlife rare plants and wildlife and the Margaree Heritage River that it feeds margaree river

Sincerely,

Mrs. Laurel Cameron-Harrison
From: michaele kustudic
To: <frac-review@gov.ns.ca>
CC: Darrell Dexter <premier@gov.ns.ca>, Ramona Jennex <ramonajennexmla@bella...
Date: 6/7/2011 8:56 PM
Subject: The Independent: MPs call for inquiry into shale gas drilling after earthquakes

To the Committee in charge of looking into the "fracking" process in Nova Scotia:

Dear Committee members:

Although I realize that the deadline for submitting opinions on this topic (yesterday, June 6) has now expired, I feel that this article from the British publication 'The Independent' is important enough to be taken into consideration by you in your deliberations on the topic. Since I just received it today myself, I was unable to forward it to you before the stated deadline for submissions. (I have already sent a personal submission to you, a few days before the expiry of the deadline.)

This is obviously a very serious issue. The safety and health of Nova Scotia's environment, and of Nova Scotians, both present and future, could be under serious threat if the projected drilling into the shale layers deep in the earth is allowed to progress, for short-term financial gain for some interested parties.

Again, I most urgently request that the issue of possibly setting off earthquakes, if the fracking process is allowed to proceed, be seriously considered, along with all the other excellent arguments that I am sure you will have received from many concerned Nova Scotians, as you make your deliberations about whether the process should be allowed at all in our province.

Respectfully,

-Michaele Kustudic

> > MPs call for inquiry into shale gas drilling after earthquakes
> > Wednesday, 8 June 2011
> > Ministers were facing growing pressure last night to investigate the safety and environmental impacts of drilling for shale gas after fears that it could have triggered two small earthquakes in Lancashire.
> >
From: Charles MacEachern
To: <frac-review@gov.ns.ca>
Date: 6/8/2011 3:17 PM
Subject: Hydraulic Fracturing Study Submission

Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
P.O. Box 442
Halifax, N.S. B3J 2P8

Re. Hydraulic Fracturing Study Submission

On April 6, 2011, the Nova Scotia Department of Energy and the Department of Environment joined forces to look at the environmental issues surrounding hydraulic fracturing as a result of public concern over possible contamination of drinking water, following reports from New York and Pennsylvania in the US. In an unprecedented showing of transparency, these two government ministries called on Nova Scotians to participate in this study designed to examine the effects on groundwater; use and effects on surface water; impacts on land, such as potential soil contamination; waste management, including surface ponds of produced waters; management of additives in hydraulic fracturing fluids; site restoration; and financial security / insurance.

Similar studies conducted by governmental agencies and respected authorities in the US and the UK have unanimously concluded that hydraulic fracturing is safe, thus, non-threatening to the environment or to public health, and their respective governments have instituted regulatory policies and procedures to ensure optimal health, safety and environment (HSE) industry standards are not only implemented, but enforced, and appropriate contingency plans are instituted to effectively mitigate and remediate aquifer (groundwater) and surface environments. It will be the responsibility of our provincial government to adopt effective policies, procedures and "best practices" (legislated standards) and to put in place the monitoring process to ensure adherence to these standards for the protection of the environment and public health and the control of respective management processes as it relates to waste water disposal, chemicals used, site restoration and the necessary financial security including insurance requirements to be obtained by drilling contractors and or exploration and development companies.

Special interest groups will have you believe that hydraulic fracturing is the cause of groundwater and subsequently, well and surface water contamination, and they are actively lobbying provincial governments to place a moratorium on hydraulic fracturing. Many of these organizations have supported their claims with pseudoscience which by definition is a collection of beliefs or practices mistakenly regarded as being based on
scientific method. Fortunately, their findings have been unsubstantiated to date, however; their visibility and voice is respectively larger and louder than their opposition.

Hydraulic fracturing is the process of well stimulation used to recover natural gas and oil from deep well formations. The well is injected under high pressure with about 99.5% water and sand mixture and usually 0.5% of chemicals, used to prevent the build-up of bacteria and algae in the formation and well, to reduce corrosion in the pipe and to improve viscosity or the rate of flow. The injection process breaks up the rock formation to release the natural gas or oil trapped in the rock. Since its inception in 1949, it is a process that has been used by nearly 90% of all natural gas wells in the US and more than 500,000 wells here in Canada. To date, more than 2.5 million wells have been hydraulically fractured (fracked) in North America and there have been no substantiated, reported incidents of groundwater contamination or risk to public health and safety. Incidentally, it should be noted that the "fracking debate" is not about the release of hydrocarbons from deep within the well, it is about the flow of injected chemicals up through the rock formation to the ground and surface water. The US Environmental Protection Agency (EPA) concluded in their very extensive study, that hydraulic fracturing does not create pathways for fluids to travel thousands-of-feet between rock formations to affect the groundwater supply.

Furthermore, a world-leader in hydraulic fracturing recently conducted a study which looked at more than 3,000 hydraulic fracturing jobs done over the past decade. Using underground sensors they monitored the hydraulic fractures - how the rock cracked, how far the fluids infiltrated into the gas reservoirs. What they found was that even in the most successful fractures, none of the fracture fluids or chemicals migrated closer than 4,500 feet below the surface - thousands of feet below the nearest water table. Now, understanding there are thousands-of-feet between the rock formation and the groundwater, a hydraulic fracture is considered highly successful if it can move fluids a mere 300 feet, which is why it is and has been scientifically impossible for these underground resources to come in contact with one another (aka cross-flow) and why there has not been a single case of groundwater contamination ever substantiated.

The following table lists the chemicals commonly used in shale fracturing (fracs)

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Use</th>
<th>Consequences of Not Using Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Removes near well damage
Higher treating pressure, slightly more engine emissions.

Biocides
Controls bacterial growth
Increased risk of souring the formation and corrosion in pipe.

Corrosion Inhibitor
Used in acid to prevent corrosion of pipe
Sharply increased risk of pipe corrosion from acid. Well integrity compromised.

Friction Reducers
Decreases pumping friction
Significantly increases surface pressure and frac pump engine emissions.

Gelling Agents
Improves proppant placement
Increased water use. Natural gas recovery may decrease in some cases by 30 to 50% where frac fluids must be gelled (conventional fracs).

Oxygen Scavenger
Prevents corrosion of well tubular by oxygen
Corrosion sharply increased and well integrity (containment) compromised.

The following table list examples of how much of each chemical is used

Chemical
Common in Shale Frac
Concentration

Acid (15% HCl)
Yes
2000 gallons total

Bacteria Control
Yes
0.0 to 0.001%

Friction Reducer
Yes
0.01 to 0.025%

Oxygen Scavenger (ammonium bisulfite)
Yes
0.005%

Corrosion Inhibitor
Yes
0.001% in the frac to 0.2% in acid

Surfactants (multiple products - similar to products in dish washing soaps)
Commonly used
0.005 to 0.01%

Gelling Agent (guar gum or cellulose product)
Only in hybrid fracs
10 to 20 lb/1000 gallons

Cross Linker (borax derivative)
In some hybrid fracs
varies

KCl (Potassium Chloride)
Uncommon in shale
2%

Gel Breaker (ammonium persulfate)
Only with gel
0.01%

pH adjusting agent (sodium carbonate)
Only with gel
0.01%

Scale Inhibitor (5% to 10% active phosphate ester
or 0.02 to 0.4% ethylene glycol)
Rare
1 to 2 gallons per 1000 gallons

Iron Control (Citric Acid)
Rare
0.001 to 0.004%

The following table lists the chemical risks for common shale frac additives

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Composition</th>
<th>Common Use</th>
<th>What it Breaks Down To?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acid (HCl)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
15% hydrochloric acid

Treating swimming pools

Water and chloride salt.

Biocides
Sodium hypochlorite

----------------------
Chlorine dioxide
Treating swimming pools

----------------------
Treating drinking water
Chloride ions and salts

----------------------
Chloride ion

Corrosion
Inhibitor
for acid

Usually not green, but green forms starting to appear
Pharmaceuticals, boilers, plastics
Amines, nitrates and salts. Readily adsorbed in the formation.

Friction
Reducers
Polyacrylamide

Soil and water

treating, cosmetics

Polymer chain - most stays in the formation.

Gelants

Guar gum,

Cellulose and
derivatives

Food additive,
cosmetics

Chain decomposes to short chains in water - eaten by bacteria when aerobic conditions are reached.

Oxygen

Scavenger

Ammonium

bisulfite

Used in food and

beverage

processing

Forms sodium sulfate, naturally occurring neutral pH salt, returns with water.

Un-reactive to oxidation or reduction.

Regarding the "venting" to the atmosphere of hydrocarbons such as natural gas, each provincial jurisdiction sets its own allowable limits. Incidentally, venting pressure (kilopascal or kPa) of hydrocarbons is measured in meters (m) drilled. Consider the following. If one province allows for venting to 15 kPa per meter drilled (kPa/m), then their gas venting will allow for up to, but to not exceed 15 kPa/m drilled and the respective government regulatory body would regularly monitor the amount of hydrocarbons vented to ensure compliance. If another province allows for 18 kPa/m, then up to 18 kPa/m of gas will be vented into the atmosphere. If a
province allows for venting to 0 kPa/m, then it will be regulated that 0 kPa/m will be vented to the atmosphere. The integrity and installation of the well casing determines how many kPa/m of gas is vented. Obviously, a well casing designed to vent 0 kPa/m is more expensive to install than a well casing designed to vent 15 kPa/m and if 0 kPa/m is the regulated, environmental requirement in Nova Scotia, than 0 kPa/m will be the allowable amount vented. To achieve 0 kPa/m, the province of Nova Scotia simply needs to regulate and enforce industry to comply with case venting to 0 kPa/m.

Hydraulic fracturing has been safely exercised for more than 60 years. The practice in Nova Scotia, not unlike other jurisdictions across Canada, will need to be monitored - not only by the industry, but by government and independent, third-party companies and agencies that specialize in ensuring HSE standards are adhered to. The hydraulic fracturing methods employed will need to be best industry practices and will need to be regulated to ensure compliance with the high-standards Nova Scotia has employed in other industrial and commercial jurisdictions.

By comparison, in Canada, more than 7000 homes each year leak some or all of the contents of their home heating oil tanks. In Nova Scotia, this amounts to hundreds of spills each year from home heating oil tanks. Many of these incidents go unreported. This is in addition to the hundreds-of-millions of litres of chemicals that are sold to consumers every year to clean their homes, vehicles and recreational vehicles and to treat their lawns and gardens. The use of these chemicals is largely unregulated and causes more preventable pollution to our lakes, rivers, streams and groundwater than the heavily-regulated, Canadian oil and gas industry. Industry and government alike have best practices employed to ensure proper maintenance and management of HSE. In the rare event there is a contamination event; government and industry have contingency plans in place to remediate and to further mitigate against repeated events.

If groundwater ever becomes contaminated, it is because of how wells are cased close to the surface, not because hydraulic fracturing chemicals, from a mile underground, are going to infiltrate the water table. Regulations governing how wells must be cased should be an acceptable drilling standard and criteria in Nova Scotia and it would be absurd to even consider a ban on hydraulic fracturing. To ban hydraulic fracturing would be a step in the direction of banning drilling and banning drilling in Nova Scotia would have a significantly negative economic impact. Nova Scotia has an abundance of onshore and offshore natural resources and just as we need to create policies and procedures to protect the health and safety of our environment, we need to create an economic climate to attract industry and investment. The alternative, as we are presently experiencing, will remain to be the out-migration of our youth and highly-skilled workforce along with the various companies we have watched leave, further depleting our provincial, financial resources, resulting in deep budget cuts across all sectors that we are now experiencing.
The future of Nova Scotia is our responsibility and we need to work together to create a better future for our children and theirs. We can do this by working with government and industry to develop and employ local and regional business and investment strategies. Developing a responsible onshore drilling program custom-designed to suit Nova Scotia is a great place to start.

Sincerely,

Charlie MacEachern
From: Karen Tam Wu <karen@forestethics.org>
To: <energyminister@gov.ns.ca>, <mlashelburne@eastlink.ca>, <frac-review@gov...
CC: <groundwater@ecologyaction.ca>, Shannon McPhail <shannon@skeenawatershed...
Date: 6/8/2011 10:33 PM
Subject: Hydraulic fracturing study comment
Attachments: Letter to NS Hydraulic Fracturing study.pdf

Dear Honourable Ministers Parker and Belliveau,
Please accept our letter regarding Nova Scotia's Hydraulic Fracturing study.
We apologise that is being sent later than the deadline, but hope that you
will still find our comments helpful.

We look forward to the results of the public comments.

Sincerely,
Karen Tam Wu and Shannon McPhail
---
karen tam wu, RPF
senior conservation campaigner

ForestEthics
because protecting forests is everyone's business

350-163 west hastings
vancouver, bc v6b 1h5
tel: 604.331.6201, ext. 226
web: www.forestethics.org
Hydraulic Fracturing Study
Environmental Science and Program Management Division
Nova Scotia Environment
PO Box 442
Halifax NS
B3J 2P8

6 June 2011

Dear Honorable Ministers Charlie Parker and Minister Sterling Belliveau:

RE: Nova Scotia Hydraulic Fracturing Study

We are writing you as representatives of two conservation organizations in British Columbia, concerned about the potential detrimental impacts of hydraulic fracturing. Fracturing is an issue that we are also addressing in our own province. While we understand that this study is of provincial jurisdiction, the impacts hydraulic fracturing may have on water resources is a global issue. We applaud your government's leadership in undertaking a study to determine the environmental impacts of hydraulic fracturing, and believe that other jurisdictions will look towards Nova Scotia's example.

We strongly encourage your government to investigate the following in the scope of your study:

- Public policies that provide incentives to the natural gas industry to extract shale gas (among the most expensive to access and extract), which may distort investment decisions that lead to rapid expansion of the resource, at the wrong time in the market cycle, thereby minimizing the return to the province's residents from the exploitation of this limited resource
- Health and safety implications of hydraulic fracturing as part of gas development
- The phenomenal amount of water required for hydraulic fracturing and the implications of the use and disposal of the toxins this technology requires, and cumulative impact of multiple industrial users extracting surface and groundwater from the same river and/or watershed
- Comprehensive modeling of a fully developed gas project to demonstrate the cumulative impacts and associated Environmental Assessment process
- The significant additional carbon emissions from this industry and how such emissions alone will undermine provincial greenhouse gas reduction targets
How First Nations rights and title may be affected by natural gas extraction, particularly through hydraulic fracturing

As more and more jurisdictions announce bans, moratoriums and investigations into hydraulic fracturing, the public has become increasingly aware of the potential significant cumulative impacts on the environment, public health and safety, water utilization, seismic activity, land use, and energy demand from the use of this technology.

We believe that in order for Nova Scotia and other provinces in Canada to avoid increasing and significant public protest over the application of hydraulic fracturing and the development of the province's unconventional gas resources, a robust study of the impacts on the economy, public health, and the environment must be considered. We commend your government on taking this step towards responsible sustainable development of this finite resource.

Sincerely,

Shannon McPhail
Executive Director
Skeena Watershed Conservation Coalition

Karen Tam Wu
Senior Conservation Campaigner
ForestEthics
Thank you, Kathy Johnson
Constituency Assistant to Sterling Belliveau:

Confidentiality Warning: The information contained in this transmittal is personal and confidential. It is intended solely for the use of the individual(s) named above. Please be advised that any reading, copying, disclosure, appropriation or dissemination of the contents of this transmission by anyone other than the named recipient(s) is strictly prohibited. If you have received this communication in error or have any problems with this transmission, please notify the sender.
June 5, 2011

The Honourable Sterling Belliveau
Minister of Environment
3441 HWY #3;
P.O. Box 595
Barrington Passage,
Nova Scotia
B0N 1G0

Dear Minister Belliveau:

RE: Review of Hydraulic Fracturing for Natural Gas

I am writing to object to the limited scope of your government’s upcoming inquiry, which omits the most essential question to me and my neighbors: that is, should fracking be allowed in Nova Scotia? The result of the review should not be limited, as it currently is, to “make[ing] recommendations to the Ministers to ensure industry and regulatory best practice is being employed in the province." Regulation is not the issue.

As a resident on that have been fracked so far in Nova Scotia, already with disastrous consequences. Of these wells, one [Triangle N-14-A] 5% of the fluids injected—typically 5 to 6 million litres - were not recovered. According the company, the lost fluids must have gone into a fault. At a typical 2% of chemicals and solvents classified as hazardous wastes, that would be about 100,000 litres that went somewhere…. less than 500 metres from the Department of Natural Resources identified ‘rich wetland’ of Noel Lake.

The fracking process involves other serious risks, now well documented. These include negative impacts upon the water, soil, air, forests, and wildlife; health problems including cancers, endocrine disruption and respiratory damage. In addition, such exploration would have a negative impact on our property values and be a major disruption to the unique way of life in our rural communities.

Nova Scotia should learn from other jurisdictions, such as Quebec and New York State, where a more cautionary approach has been taken toward such gas developments. Both jurisdictions have placed moratoriums on such development pending further study.

There should be a public inquiry in many communities across the province, wherein the people would have ample opportunity to express their views, rather than this limited inquiry with its short timelines.

Sincerely,

K. Donovan
June 10th, 2011

Bob Green
Nova Scotia Department of Energy
P.O. Box 2664
5151 George Street
Halifax, NS
B3J 3P7

Via Fax Only: (902) 424-0528

Dear Mr. Green:


I write to in response to your letter dated May 4th, 2011 on the above noted. Kwilmu'kw Maw-Klusuaq Negotiation Office (KMKNFO) has conducted a preliminary internal analysis on the Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia to determine any potential impacts to Mi'kmaq Right and Title, as well as, any other concerns pertinent to the Mi'kmaq of Nova Scotia.

Mi'kmaq of Nova Scotia have a general interest in all lands in Nova Scotia, as the Mi'kmaq of Nova Scotia have never surrendered, ceded, or sold the Aboriginal title to any of its lands in Nova Scotia. Consequently, it has an interest in all lands and waters in and around Nova Scotia.

According to the Fact Sheet "Department of Energy Request for Exploration Proposals Process Onshore Nova Scotia" (released April 2011 as part of the Fracking Review Process), any Industrial Approval application "...includes details about the area where the activity is proposed, including proximity to water courses; details on fluids, including handling and disposal; monitoring of fluids, and an emergency response plan. Nova Scotia Environment also requires a complete list of any chemicals to be used. Approvals contain project-specific terms and conditions and public consultation may be required." It is recommended that a Mi'kmaq Ecological Knowledge Study (MEKS) be required as part of its application.

There are concerns about the effects of fracking on contemporary Mi'kmaw harvesting, particularly FSC harvesting, and the potential effects on water quality for all Nova Scotians in the vicinity of a fracking operation. Again, it is recommended that any application for industrial approval submitted by a proponent should include a MEKS.

KMKNFO's Archaeological Research Division (ADR) believes it is necessary to conduct full archaeological impact assessments, with subsurface testing components, for all components of gas exploration and development – including, but not limited to, access roads (and the upgrading
of existing right-of-ways), well pads, borrow pits, sump pits/ponds, storage areas, workspaces, temporary work camps, and any other ancillary development, including distribution pipelines, with the potential for disturbing archaeological deposits.

KMKNO understands that the scope will focus primarily on issues with regards to water, and will examine the following potential environmental issues:
- effects on groundwater;
- use and effects on surface water;
- impacts on land, such as potential soil contamination;
- waste management, including surface ponds of produced waters;
- management of additives in hydraulic fracturing fluids;
- site restoration; and
- financial security / insurance.

KMKNO has taken this opportunity to provide comments on the bullets of Scope for Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia.

It must be noted that hydraulic fracturing can take place in oil/gas exploration and development; therefore it is recommend that the Province expand the scope to include all hydraulic fracturing associated with hydrocarbon exploration and development.

Regarding the first two bullets on effects on groundwater and surface water, it is recommended this applies not only to man-made use of these resources but also use by others i.e. aquatic life. Although a full blown environmental impact assessment may not be necessary, the exploration program should require the undertaking of an initial assessment to define the valued ecosystem components in the area. This knowledge determines how much bonding is required for the operator, which ties into the financial security and insurance component of this scope.

Geological formations and groundwater aquifers are physically complex, it is difficult to know what may occur with successive fracking operations. In terms of effects on groundwater regards, one of the critical components is to have baseline information on any groundwater wells and structures in the area. The possibility for contamination supports the need for effective regulation to protect groundwater and domestic wells from the impacts of fracking, a well as, emphasizes the need to address cumulative effects. There should be a detailed methodology for what to look for i.e. well yield, water levels, water chemistry, gases in groundwater and gases in soil, what gases might be expected etc. Therefore, the Scope should include development of appropriate methods for determining baseline conditions in adjacent wells and properties. The proponent should be required to map ground water, and keep a record of water usage.

The hydraulic fracturing process requires the use of chemicals during the drilling process; therefore, it is recommended that full public disclosure of all chemicals used in the fracturing fluids should be required before any approvals given by the Province. All flow-back fluids at hydraulically fractured wells should be captured, securely stored and then treated to a high enough standard that they can be reused in subsequent fracturing operations.
The exploration of hydrocarbons usually target deep deposits i.e. over 1000 m deep. This means they have to drill through the upper zones where aquifers are positioned that are used for water supplies i.e. the top 50 to 200+ m. Therefore one of the groundwater issues is how deep to position the surface casing in order to protect that upper groundwater aquifer. This is not only a technical issue, but there is overlap in regulatory jurisdiction between NS Environment, NS Natural Resources and NS Department of Energy. Therefore, there should be a component in the Scope of Work focusing on the issue of overlapping regulatory jurisdiction. It is recommended that all authority to water rights and regulated wastewater disposal rest with one regulatory authority. As well, information on all water assignments and water withdrawals should be publicly available.

Research has indicated one of the greater risks for allowing release of fracking fluids is not the hydraulic fracturing fluids coming up to surface through new fractures created in the rock and soil, but release of these up along the well itself due to poor well construction. Therefore, the scope should include an entire section associated with defining appropriate well construction particularly with cementing of casing, abandonment procedures and design/testing of BOPs, etc. Although a well is properly constructed and hydraulic fracturing is done correctly, one of the release mechanisms to surface may be through nearby old, improperly abandoned exploration holes. Therefore, the Scope should include such holes located near property to be explored and address the issue of nearby old, improperly abandoned exploration holes.

Monitoring during operations needs to be added to the scope of this review, since this determines when the emergency response plan is triggered, and is critical to the protection of water resources and environment. Emergency Response Plans outlined what proponent with do in the event of an emergency, but it tends to be general. In addition if something does go wrong there are a lot of regulatory agencies involved and who takes the lead - who decides when remedial work is required, etc etc needs to be worked out in advance. Therefore the Scope should include developing a good outline of what will be required for an ERP - both from operator and government and possibly First Nations regulatory agencies view point.

At this time, I wish to request draft copy of the Review of Hydraulic Fracturing in Shale Gas Operations in Nova Scotia upon completion to KMKNO for internal review and comment. We look forward to working with the Department of Energy on this particular item.

Yours in Recognition of Mi’kmaq Rights and Title,

Twila Gaudet, BA, LL.B.
Consultation Liaison
Kwilmu’kw Maw-Klusuaq Negotiation Office

cc: Jay Hartling (OAA)

K.M.K.N.O.

JUN 10 2011
Fax: Boogreen
Email: KMKNO CT

902-424-4225

Page 3 of 3