Moving Forward
BC Fracture Fluid Disclosure and
www.fracfocus.ca Overview

Stuart Venables, PGeo, Senior Petroleum Geologist
BC Oil and Gas Commission
Thank you, Governor Bentley

Roll Tide, Roll Tide!

2011 National Champions
**Hometown:** Ottawa, ON

**University:**
Wolfville, NS
Acadia U.
B.Sc. (hons)
Geology 1999

**Industry:**
Calgary, AB
1999-2010

**Regulatory:**
Victoria, BC
2010 to 2035

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Topics: Moving Forward

BC Fracture Fluid Disclosure
- Timeline
- Regulations

Jurisdictional Comparison
- Canada
- US

Fracfocus.ca
- Relationship with Fracfocus.org

Next Steps
- Fracfocus 2.0
- Forging partnerships
October 4, 2010
Initial seed planted with the implementation of the *Oil and Gas Activities Act (OGAA)*

**Oil and Gas Activities Act**

- **Pipeline and Liquefied Natural Gas Facility Regulation**
- **Consultation and Notification Regulation**
- **Drilling and Production Regulation**
- **Environmental Protection and Management Regulation**

**Other Regulations:**
- Geophysical Exploration Regulations
- Administrative Penalties Regulation
- Fee, Levy and Security Regulation
- Oil and Gas Activities General Regulation
- Prescribed Roads Regulation

- **Drilling and Production Regulation (DPR): Section 37**
  - “A well permit holder must maintain detailed records of the composition of all fracturing fluids that are used in a well for which the well permit holder is responsible”
Media Release:
INCREASED TRANSPARENCY FOR NATURAL GAS SECTOR
FORT NELSON, Sept 9, 2011 – Premier Christy Clark announced a plan which will increase the transparency around hydraulic fracturing practices used in the industry.

Starting in Jan. 2012, an online registry – accessible to everyone – will allow visitors to search for the locations of where hydraulic fracturing activities are taking place, and for detailed information about the practices and additives used during these activities.

http://www.youtube.com/watch?v=vFhS8dJuQtw&feature=player_embedded
Amendments to DPR:

- **37 (1)** A well permit holder must maintain detailed records of the composition of all fracturing fluids that are used in a well for which the well permit holder is responsible, including, but not limited to
  
  (a) the well authorization number,
  (b) the fracture date,
  (c) an identification of the fluid ingredients and a description of the purpose of each,
  (d) an identification of the ingredient concentration in the additive and in the hydraulic fracturing fluid,
  (e) the chemical abstract service number of each ingredient,
  (f) an identification of the total volume of water injected with the ingredients, and
  (g) the trade name and supplier of each ingredient.

- **37 (2)** A well permit holder must submit to the commission the records referred to in subsection (1) within 30 days after the completion of the well.

Amendments to General Regulation:

- **17.1 (1)** The following records or reports are not subject to section 15 of this regulation:
  (a) records or reports submitted to the commission under section 37 of the Drilling and Production Regulation

  (b) (2) The commission must publish the records and reports referred to in subsection (1) (a) as soon as practicable after receiving those records and reports.
BC Disclosure: Sec 37 DPR and Sec. 17.1 General Regulation

- General well info and data plus ingredient suppliers, purpose, concentrations and Chemical Abstract Services Number (CAS #)
- Electronic submission of data
- Must be made public by the Commission

AB Disclosure: Directive 059 – April 2012

- General well info and data plus carrier fluid sourcing, additive name, supplier and purpose and fracturing monitoring being undertaken (e.g. Microseismic)

PQ Disclosure: Environmental Quality Act (EQA) – June 2011

- EQA Sec 22: Certificate of Authorization required prior to any work to be performed
- Regulation under the EQA give specifics: General well info and data plus volume of fluids and the detailed composition and characteristics of the additives used for fracturing and a water management plan
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Disclosure</th>
<th>Effective Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>British Columbia</td>
<td>YES</td>
<td>January 1, 2012</td>
</tr>
<tr>
<td>Arkansas</td>
<td>YES</td>
<td>January 15, 2011</td>
</tr>
<tr>
<td>Colorado</td>
<td>YES</td>
<td>April 1, 2012</td>
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<td>Louisiana</td>
<td>YES, MSDS only</td>
<td>October 20, 2011</td>
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<td>Montana</td>
<td>YES</td>
<td>August 26, 2011</td>
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<td>New Mexico</td>
<td>YES, MSDS only</td>
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<td>North Dakota</td>
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<td>April 1, 2012</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>YES, MSDS only</td>
<td>February 5, 2011</td>
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<td>Texas</td>
<td>YES</td>
<td>February 1, 2012</td>
</tr>
<tr>
<td>Wyoming</td>
<td>YES, Pre/Post-Op</td>
<td>October 17, 2010</td>
</tr>
</tbody>
</table>
Welcome to FracFocus, the hydraulic fracturing chemical registry website. This website is a joint project of the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission.

On this site you can search for information about the chemicals used in the hydraulic fracturing of oil and gas wells. You will also find educational materials designed to help you put this information in perspective.

Groundwater Protection: Priority Number One

Hydraulic fracturing, or 'frac' as it is often referred to, is a process used to fracture rock formations to enable the recovery of hydrocarbons such as oil and natural gas from reservoirs. While the process has already been widely utilized in oil and gas extraction, the need for its use has increased as oil and gas reservoirs are becoming more depleted. It is also often used in environmental remediation to excavate hazardous waste and other chemicals from the environment.

The process involves the injection of fluids, often including water, proppants, and chemicals, into a wellbore at pressures high enough to fracture the formation, creating pathways for the fluids to flow more freely to the wellhead for collection. These fractures penetrate the formation in both the vertical and horizontal directions.

While the benefits of this technology are numerous, the potential environmental impacts are significant. The potential impacts are due to the large volumes of water required to carry chemicals and energy to the wellhead, the potential for the release of large amounts of methane gas, and the potential for spills of the fluids used during the frac process.
Company Registration

Use the form below to apply for a new Company account to be used to submit chemical data to the registry.

Note: Upon submission of application for a new Company notice will be sent to the Hydraulic Fracturing Disclosure Administrator for approval.

New Company Registration

Email:  
Confirm Email:  
First Name:  
Last Name:  
Address:  
City:  
State:  Postal Code:  
Phone: 555-555-5555  
Company:  
Find a Well

SEARCH OPTIONS

STATE: Texas
COUNTY: Choose a County
WELLS IN COUNTY: Choose a Well Name

OPERATOR: XTO Energy/ExxonMobil
API WELL NUMBER: __________
WELL NAME: 

SEARCH  RESET  (Note: One search option is required to do a search.)

LATEST WELLS

API Number: 4222736902
Well Name: Long 21-2
Operator: Athlon Energy Operating LLC

API Number: 0423723033
Well Name: C-245A
Operator: Occidental Oil and Gas

API Number: 0423723051
Well Name: C-651A
Operator: Occidental Oil and Gas

API Number: 0423727149

All FracFocus well site information is voluntarily provided by participating oil and natural gas operators. Wells hydraulically fractured after January 1, 2011 will be added to the database over time.

See the full list of participating production companies.
# Hydraulic Fracturing Fluid Product Component Information Disclosure

**Fracture Date:** 4/24/2012  
**State:** TX  
**County:** Howard  
**API Number:** 42-227-36902  
**Operator Name:** Athlon Energy  
**Well Name and Number:** Long 21-2  
**Longitude:** -101.5322112  
**Latitude:** 32.2899555  
**Long/Lat Projection:** NAD27  
**Production Type:** Oil  
**True Vertical Depth (TVD):** 9,900  
**Total Water Volume (gal)**: 1,267,938

## Hydraulic Fracturing Fluid Composition:

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Supplier</th>
<th>Purpose</th>
<th>Ingredients</th>
<th>Chemical Abstract Service Number (CAS #)</th>
<th>Maximum Ingredient Concentration in Additive (% by mass)**</th>
<th>Maximum Ingredient Concentration in HF Fluid (% by mass)**</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>WATER (CLEAN - ACID)</td>
<td>Athlon Energy</td>
<td>Carrier / Base Fluid</td>
<td>Water</td>
<td>7732-18-5</td>
<td>100.00%</td>
<td>91.82448%</td>
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<tr>
<td>CIA-5</td>
<td>Universal</td>
<td>ACID CORROSION INHIBITORS</td>
<td>METHYL ALCOHOL</td>
<td>67-56-1</td>
<td>40.00%</td>
<td>0.00097%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>PROPARGYL ALCOHOL</td>
<td>107-19-7</td>
<td>8.00%</td>
<td>0.00019%</td>
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<tr>
<td>B-4</td>
<td>Universal</td>
<td>BREAKERS AND BREAKER CATALYSTS</td>
<td>Ammonium Persulfate</td>
<td>7727 - 54 - 0</td>
<td>96.00%</td>
<td>0.00374%</td>
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<tr>
<td>B-6E</td>
<td>Universal</td>
<td>BREAKERS AND BREAKER CATALYSTS</td>
<td>Ammonium Persulfate</td>
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<td>0.00130%</td>
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<td></td>
<td></td>
<td></td>
<td>Cured Acrylic Resin</td>
<td>Trade Secret</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Talc</td>
<td>14807 - 9</td>
<td>2.00%</td>
<td>0.00003%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Silica, Crystalline - Quartz</td>
<td>14808 - 60 - 7</td>
<td>10.00%</td>
<td>0.00017%</td>
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<tr>
<td>CX-9</td>
<td>Universal</td>
<td>CROSSLINKERS AND DELAYERS</td>
<td>Potassium Metaborate</td>
<td>13709-94-9</td>
<td>30.00%</td>
<td>0.02316%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Potassium Hydroxide</td>
<td>1310-58-3</td>
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<td>0.00386%</td>
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<td></td>
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<td></td>
<td>Ethylene Glycol</td>
<td>107-21-1</td>
<td>10.00%</td>
<td>0.00772%</td>
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<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>7732-18-5</td>
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<td>0.05790%</td>
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<tr>
<td>WFR-3</td>
<td>Universal</td>
<td>FRICTION REDUCERS</td>
<td>Alcohol Ethoxylate Surfactants</td>
<td>Trade Secret</td>
<td>8.00%</td>
<td>0.00076%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cationic Polycrylamide co polymer</td>
<td>Trade Secret</td>
<td>35.00%</td>
<td>0.00334%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hydrotreated Petroleum Distillate</td>
<td>64742-47-8</td>
<td>30.00%</td>
<td>0.00287%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sodium Chloride</td>
<td>7647-14-5</td>
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<td>0.00019%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
<td>7732-18-5</td>
<td>35.00%</td>
<td>0.00334%</td>
<td></td>
</tr>
<tr>
<td>WGA-1A SLR</td>
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<td>GELLING AGENTS FOR WATER</td>
<td>Petroleum Distillates</td>
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<td></td>
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<td>Polysaccharide blend</td>
<td>Trade Secret</td>
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<td>0.07674%</td>
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<tr>
<td>I-2L</td>
<td>Universal</td>
<td>IRON CONTROL ADDITIVES</td>
<td>ACETIC ACID</td>
<td>64-19-7</td>
<td>82.00%</td>
<td>0.00222%</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Water</td>
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<td>20.00%</td>
<td>0.00054%</td>
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<tr>
<td>NE-1</td>
<td>Universal</td>
<td>NON-EMULSIFIER AND WATER</td>
<td>Methyl Alcohol</td>
<td>67-56-1</td>
<td>15.00%</td>
<td>0.00014%</td>
<td></td>
</tr>
</tbody>
</table>
Welcome to the Hydraulic Fracturing and Fracture Fluid Information Site. This website is a project of the BC Oil & Gas Commission and is intended to provide objective information on Hydraulic Fracturing, Fracturing Fluids, Groundwater and Surface water protection and related oil and gas activities in Canada.

FAQs

Q. I know there are wells in my area that have been fractured, but when I search for them I get no results. Why?

A. The most likely reasons are that either the wells were fractured before January 1, 2012 or they have not yet been entered into the system. Only wells fractured after Jan. 1st, 2012 will be entered into the system and since the uploading of records began only recently it will take some time before a large number of wells is available. Furthermore, permit holders in B.C. have 30 days from the time their completion operations have finished to submit their records. Please keep checking back as wells are added on a daily basis.

Canada's first hydraulic fracturing registry now online

British Columbia is the first province in Canada to enforce the public disclosure of ingredients used for hydraulic fracturing.

FracFocus.ca - the registry which provides a transparent accounting of B.C. hydraulic fracturing operations - includes a database of the ingredients used to support natural gas extraction, and extensive content about the regulations and safety procedures governing industry activity.

Read more
Hydrologic Cycle, Groundwater, Aquifers and Surface Water

Nearly 9 million Canadians rely on groundwater for domestic use (Source: Statistics Canada), which makes it an essential resource. Geologic strata that contain significant amounts of moveable water are called aquifers. Aquifers can carry fresh, brackish or saline water. Formation or ground water quality is often described by its Total Dissolved Solids (TDS) concentration.

The hydrologic cycle describes the natural circulation of water through our atmosphere, surface and subsurface. During the cycle, water undergoes natural transformations. Water will fall from the atmosphere in the form of precipitation and land on the surface. Some of this water will remain on the surface and drain into rivers and lakes, while another portion will soak into the ground or be absorbed by plants and the remainder may evaporate back into the atmosphere again.

Initial water seepage entering the subsurface goes into the unsaturated or vadose zone, which has mix of air and water. Some of this water will be taken up by roots or will coat the soil, but the remainder will continue through to the saturated zone, which is the entire region below the water table, contributing to recharge of localized aquifers.

Water And Hydraulic Fracturing

Domestic Water Protection
- Groundwater & Aquifers
- Groundwater Terms & Myths
- Water Use, Recycling and Injection
- Drilling and Production

Looking for information about a well site near you?

Search for nearby well sites that have been hydraulically fractured to see what chemicals were used in the process.

FIND A WELL

You have questions. WE HAVE ANSWERS.

Find out what you’d like to know about hydraulic fracturing. And if you don’t find your answer here, drop us a line using our “Ask a Question” section.

HOW HYDRAULIC FRACTURING WORKS
Regulations & Contacts

Alberta

Energy Resources Conservation Board

Suite 1000, 250 – 5 Street SW
Calgary, AB
T2P 0R4

Toll Free 1-855-297-8311
Phone: (403) 297-8311
E-mail: inquiries@ercb.ca
Website: www.ercb.ca

About the Energy Resources Conservation Board

Regulations:

AB Legislation
Oil and Gas Conservation Regulations
Oil and Gas Conservation Act
Directive 059
### Additive

<table>
<thead>
<tr>
<th>Sort Order</th>
<th>CAS #</th>
<th>Ingredient Name</th>
<th>Maximum Additive Concentration (%)</th>
<th>Maximum Fluid Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>67-63-0</td>
<td>Isopropanol</td>
<td>80.0</td>
<td>0.04048</td>
</tr>
<tr>
<td>2</td>
<td>104-76-7</td>
<td>2-Ethylhexanol</td>
<td>13.0</td>
<td>0.00658</td>
</tr>
<tr>
<td>3</td>
<td>64742-94-5</td>
<td>Solvent naphtha (petroleum), heavy aromatic</td>
<td>13.0</td>
<td>0.00658</td>
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<tr>
<td>4</td>
<td>68607-28-3</td>
<td>Dimethylcocoamine, bis[chloroethyl] ether, diquatery ammonium SALT</td>
<td>7.0</td>
<td>0.00354</td>
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<tr>
<td>5</td>
<td>67-56-1</td>
<td>Methanol</td>
<td>1.5</td>
<td>0.00076</td>
</tr>
</tbody>
</table>

### CSV Upload

Fill in filename (including path), then click Upload.

Uploads are only accepted for files with extensions of .csv

*File Name: WA25773.csv

[Upload]
## British Columbia

### BC Regions
- Select a Region

### Wells
- Select a Region first

### BC Operators
- Select an Operator

**Submit**

(Notes: One search option is required to do a search.)

<table>
<thead>
<tr>
<th>Well #</th>
<th>Date</th>
<th>Province</th>
<th>Region</th>
<th>Operator</th>
<th>Well Name</th>
<th>Well Type</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Datum</th>
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<tbody>
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<td>Gas</td>
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<td>26597</td>
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<td>British Columbia</td>
<td>Peace River North</td>
<td>EnCana Corporation</td>
<td>ECA HZ KIWIGANA B-015-D/094-O-07</td>
<td>Undefined</td>
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<td>56.140468</td>
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</table>

**Next**  **Last**
### Hydraulic Fracturing Fluid Product Component Information Disclosure

<table>
<thead>
<tr>
<th>Fracture Date:</th>
<th>01/28/2012</th>
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<tbody>
<tr>
<td>Province:</td>
<td>BC</td>
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<tr>
<td>Region:</td>
<td>Sunrise</td>
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<tr>
<td>Well Number:</td>
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<tr>
<td>Operator Name:</td>
<td>Tourmaline Oil Corp.</td>
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<tr>
<td>Well Name:</td>
<td>TOURMALINE ET AL HZ SUNRISE 12-13-080-16</td>
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<td>Latitude:</td>
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<td>True Vertical Depth (TVD):</td>
<td>3,650</td>
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<td>Total Water Volume (m³)*:</td>
<td>1,374</td>
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</table>

### Hydraulic Fracturing Fluid Composition:

<table>
<thead>
<tr>
<th>Trade Name</th>
<th>Supplier</th>
<th>Purpose</th>
<th>Ingredients</th>
<th>Chemical Abstract Service Number (CAS #)</th>
<th>Maximum Ingredient Concentration in Additive (% by mass)**</th>
<th>Maximum Ingredient Concentration in HF Fluid (% by mass)**</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Water</td>
<td>Water</td>
<td>Water</td>
<td>7732-18-5</td>
<td>100.00%</td>
<td>83.92925%</td>
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<tr>
<td>FR-9</td>
<td>Trican Well Service</td>
<td>Friction Reducer</td>
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<td>Trican Well Service</td>
<td>Clay Control</td>
<td>1,3-Propanediaminum-2-substituted, -hexaalkyl-, di halide</td>
<td></td>
<td></td>
<td></td>
<td>HMIRC# 7744</td>
</tr>
<tr>
<td>S-2</td>
<td>Trican Well Service</td>
<td>Surfactant</td>
<td>Isopropanol</td>
<td>67-63-0</td>
<td>80.00%</td>
<td>0.04048%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2-Ethylhexanol</td>
<td>104-76-7</td>
<td>13.00%</td>
<td>0.00658%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Solvent naphtha (petroleum), heavy aromatic</td>
<td>64742-94-5</td>
<td>13.00%</td>
<td>0.00658%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dimethyloctamone, bis(chloroethyl) ether, diquaternary ammonium</td>
<td>68607-28-3</td>
<td>7.00%</td>
<td>0.00354%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Methanol</td>
<td>67-56-1</td>
<td>1.50%</td>
<td>0.00076%</td>
<td></td>
</tr>
<tr>
<td>Busan 94</td>
<td>Trican Well Service</td>
<td>Biocide</td>
<td>2,2-dibromo-3-nitropropionamide</td>
<td>10222-01-2</td>
<td>30.00%</td>
<td>0.00238%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sodium bromide</td>
<td>7647-15-6</td>
<td>4.00%</td>
<td>0.00032%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Polyethylene glycol</td>
<td>25322-68-3</td>
<td>60.00%</td>
<td>0.00476%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Dibromacetanilide</td>
<td>3252-43-5</td>
<td>3.00%</td>
<td>0.00024%</td>
<td></td>
</tr>
<tr>
<td>Frac Sand</td>
<td>Trican Well Service</td>
<td>Proppant</td>
<td>crystalline silica</td>
<td>14808-60-7</td>
<td>100.00%</td>
<td>14.66013%</td>
<td></td>
</tr>
<tr>
<td>Frac Sand - Resin</td>
<td>Trican Well Service</td>
<td>Proppant</td>
<td>Crystalline silica (quartz) may also contain hexamethylenetetramine</td>
<td>14808-60-7, 100-97-0</td>
<td>100.00%</td>
<td>1.22168%</td>
<td></td>
</tr>
</tbody>
</table>
Next Steps

Water Sourcing
- ERCB Directive 059
- CAPP Guiding Principle #5 for Hydraulic Fracturing

Mapping Based Search Criteria
- Interactive map showing Hydraulic Fracturing Events

Six Month Review
- Technical team: OGC, CAPP and PSAC
- Pre-lim meeting May 2nd, Technical meeting May 29th

Continuous Industry Training
- First Regulator in Canada – Must work with Permit Holders

On-Going Assessment
- Open Dialogue with ERCB, Fracfocus.org, etc...
Water Sourcing

- ERCB Directive 059
  
  **Carrier fluid: Type**
  Water – (surface water, nonsaline groundwater, saline groundwater, recycled fracturing water, nonoilfield waste water, drinking water, and other oilfield water such as produced water or waste water)

- CAPP Guiding Principle #5 for Hydraulic Fracturing
  
  We will measure and disclose our water use with the goal of continuing to reduce our effect on the environment.
Water Sources

- **Surface Water**
  - Freshwater
  - Lakes, streams, rivers
  - Dugouts
  - Percentage: 65% ↓

- **Shallow Groundwater (0-200m)**
  - Unconfined or confined aquifers
  - Variable water quality, but often fresh
  - Percentage: 10% ↓

- **Deep Groundwater (>800m)**
  - Disconnected from surface water
  - Often saline
  - Can require treatment
  - Percentage: 10% ↑

- **Flowback Fluid Other**
  - Saline
  - Variable quality
  - Can require treatment
  - Percentage: 15% ↑
Next Steps

Mapping Based Search Criteria
Next Steps

Mapping Based Search Criteria
Six Month Review

- Technical team:
  - OGC, CAPP and PSAC
- Purpose:
  - Continuously improve public disclosure
  - Review and move to implement best methods
- Learn:
  - Multi-jurisdictional operators
  - Direct feedback from the Operational Level
Next Steps

Continuous Industry Training

• Update user manual regularly
• Individual and group training, as required

On-Going Assessment

• Talk to all jurisdictions
  • Sharing information
  • Co-ordination of approach
• Expand Fracture Fluid Disclosure and Fracfocus.ca
  • National Registry – NA Standard
Questions?

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2007 NATIONAL CHAMPS