Fracking: Pros, Cons, Uncertainty, and Protecting the Safety of Frostburg’s Drinking Water

Mountain Ridge Environmental Science Students

Mountain Ridge Miners

STATE FARM® YOUTH ADVISORY BOARD
Student calibrating the YSI Pro30
Tributary T1
The tag line is installed
pH was measured using a YSI pH10 Meter
Student records data onto data sheet
YSI ProODO measures dissolved oxygen
YSI Pro30 measures the specific conductivity
Turbidity being measured using a Hach Turbidimeter
She fills up one bottle

She dumps the water out downstream
The water samples are put on ice
At the Aquifer and Frostburg Reservoir, the water must be pulled and tested from buckets.
Frostburg's Water Treatment Plant

For treatment raw and treatment mixed, the water was pulled and tested from faucets
The bottle samples from the streams are shipped on ice with a chain of custody form via FedEx.
The information is inputted into our baseline water quality excel data files and then proofread independently three times.
Rock with HOBO monitor is pulled from stream
Data is collected off of the HOBO monitors
The information...is transferred to the computer via USB cord
The newly obtained data is then plotted and analyzed
Our Data
Barium and Strontium Levels in Tributary T1 February 2012-February 2013
Plotted with the Depth on a Staff Plate

Strontium
Average: 42ppb

Barium
Average: 33ppb
Barium and Strontium Levels in Tributary T1 February 2012-February 2013
Plotted with the Depth on a Staff Plate

Concentration (ppb) or Depth in Centimeters

Strontium
Average: 42ppb

Barium
Average: 33ppb
Barium and Strontium Levels in Tributary T1 February 2012-February 2013
Plotted with the Depth on a Staff Plate

Concentration (ppb) or Depth in Centimeters

Strontium
Average: 42ppb

Barium
Average: 33ppb
Specific Conductivity in Tributary T1 from June 2012-February 2013
Plotted with Depth on a Staff Plate

Specific Conductivity
Average: 132 uS/cm
Chloride, Sodium, Calcium, & Magnesium Levels in Tributary T1
September 2012-February 2013 Plotted with Depth at the Staff Plate

Sampling Month

Chloride (ppb)
Sodium (ppb)
Calcium (ppb)
Magnesium (ppb)
Depth at Staff Gauge (cm)
COMPARING OUR BASELINE DATA TO FRACKING FLUID
Chloride Concentrations at all 8 testing sites Sept 2012-Feb 2013

- Treatment Raw
- Treatment Mixed
- Frostburg Reservoir (Piney Creek Reservoir)
- Tributary T1
- Piney Creek (C6)
- Geatz Run (B7)
- Bandy Run (G8)
- Aquifer
Chloride Concentrations at all 8 testing sites Sept 2012-Feb 2013
Pure Frack Fluid also shown

930x Greater
Chloride Concentrations at all 8 testing sites Sept 2012-Feb 2013
1:100 Diluted Frack Fluid also shown

9.3x Greater
Strontium Concentrations at all 8 Testing Sites Feb 2012-Feb 2013
Strontium Concentrations at all 8 Testing Sites Feb 2012-Feb 2013 with Pure Frack Fluid

Concentration (ppb)

Sampling Month

Feb 2012 March April May June July Aug Sep Oct Nov Dec Jan Feb 2013

20,000x Greater
Strontium Concentrations at all 8 Testing Sites Sept 2012-Feb 2013 with 1:1000 Diluted Frack Fluid

20x Greater
Other Key Fracking Indicators that We Are Monitoring…

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Average Concentration in Tributary T1</th>
<th>Concentration in Frack Fluid</th>
<th>Multiple of Natural Level to Frack Fluid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bromide</td>
<td>Below 10 ppb</td>
<td>445,000 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>45,000 times</td>
</tr>
<tr>
<td>Barium</td>
<td>33ppb</td>
<td>686,000 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>21,000 times</td>
</tr>
<tr>
<td>Strontium</td>
<td>45ppb</td>
<td>1,000,000 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>20,000 times</td>
</tr>
<tr>
<td>Sp. Conductivity</td>
<td>125 uS/cm</td>
<td>700,000 uS/cm</td>
<td>5600 times</td>
</tr>
<tr>
<td>Gross-Alpha</td>
<td>3.92 pCi/L</td>
<td>1750 pCi/L&lt;sup&gt;2&lt;/sup&gt;</td>
<td>450 times</td>
</tr>
<tr>
<td>Gross-Beta</td>
<td>5.34 pCi/L</td>
<td>760 pCi/L&lt;sup&gt;2&lt;/sup&gt;</td>
<td>140 times</td>
</tr>
<tr>
<td>Iron</td>
<td>942 ppb</td>
<td>39000 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>40 times</td>
</tr>
<tr>
<td>Aluminum</td>
<td>4707 ppb</td>
<td>39,000 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>8 times</td>
</tr>
<tr>
<td>Manganese</td>
<td>672 ppb</td>
<td>2630 ppb&lt;sup&gt;1&lt;/sup&gt;</td>
<td>4 times</td>
</tr>
</tbody>
</table>

<sup>1</sup> The Center for Rural Pennsylvania, The Impact of Marcellus, 2011

<sup>2</sup> EPA- http://www.epa.gov/hfstudy/comparisonofhffluidscompositionwithproducedformationwater.pdf
What might a contamination event look like if frack fluid is diluted 1:1000? (peak is 700 us/cm)(made to scale)

Pure Frack Fluid = 700,000 us/cm

Hopefully, a contamination event like this is never observed and citizens can continue to confidently drink from the municipal water supply.
It is our hope to provide quarterly notifications indicating that the water is “still safe” to drink.

Inform the Frostburg Water Treatment Plant.

Proceed to take more detailed samples with our 20 other analytes to verify whether or not fracking was in fact the cause of the event.

We would request that a government agency would assist in further analysis, monitoring, and resolution of the issue.