The interconnections between shale gas development and drinking water quality

Environment, Nature

Shale Gas Development on Regional Water Quality Summary

Natural gas is an important energy source that enables places around the world to reduce the need for energy imports. The gas is being extracted from from porous sandstone where it’s been trapped under impermeable rock. The Marcellus Shale is predominantly found in the eastern part of the United States where extraction began in 2005. It covers roughly 70% of the state of Pennsylvania. It’s been estimated that there is a 50% chance that the Marcellus could bring in 489 trillion cubic feet of natural gas. There has also been controversy surrounding the hydraulic fracturing which include habitat fragmentation, oxygen depletion, and water quality.

Fracking became prevalent in the 1940’s to initially increase permeability of formations and has improved to the point where it is now possible to use this concept on specific types of reservoirs. Fracking fluids are made up of water that also involves other chemicals and additives that get injected into the reservoirs under high pressure in an attempt to create new fractures. The fluid used for the Marcellus shale is known as slickwater due to its lack of viscosity. The issue with the chemical additives in this process are that they are not regulated by the U. S Safe Drinking Water Act.

Statistics in 2000 show that 40 million people in the United States drink from a private well. Some regions have begun to show methane migration that result from methane seeping into the private wells from either natural or an anthropogenic source. Average to maximum concentrations of methane were found in 60 groundwater wells located within 1km of an active

Marcellus gas well. It is still being researched whether or not these concentration levels come through natural or drilling processes. In figure 4 the bromide concentrations are illustrated for the Pennsylvania surface waters. It is evident that that from 2010 to 2011 the total bromide and dissolved bromide was extremely high. There are multiple reports over 10, 000 µg/L and the EPA reports that a level where it could be a problem at 6000 µg/L.

As it gets moved to the subsurface, natural gas can be partially oxidized and mixed with other gasses. Researchers measured the presence of other hydrocarbons using the isotopic signatures of hydrogen, oxygen and carbon in the water or gas. The isotopes can give hints away as to what shale could be a source of the gas. It is still being discussed weather or not the Marcellus shale from is the source of the methane isotopes that are seen in drinking water wells. There were 48 wells sampled between 2010 and 2011 within 2500 feet of a Marcellus well and data showed there was no statistical difference before or after drilling. There is a drastic difference between northeast and southwestern Pennsylvania. The rate of detection in northeast Pennsylvania is 80 to 85% while southwest Pennsylvania shows 24% of methane in water wells.

It seems as if the research has been frequent and consistent throughout the eastern region of the United States. The tone of the article looks to be neutral and objective, however it is important to think about who benefits from fracking and what kind of agenda that data would be pushing for. The author stresses that the main issue with hydraulic fracturing would be the

seeping of gas into the shallow groundwater. It’s also a problem that the physical drilling can create problems to the environment. To improve this research, it would be beneficial to keep sampling more wells in all parts of the United States and also asses whether or not proximity to a drilling site has any correlation to methane migration. Overall this research is very credible as it has been peer reviewed and published into the Science Magazine.