

# “We all need to be aware of what can and will taint our water supply”

The Bethlehem Gadfly Environment September 26, 2020

 Latest in a series of posts on the environment 

## Second meeting on Bethlehem’s Climate Action Plan, October 7

Freedom High School Junior Somak Roy presented this essay at the “Speak out!” Sustainability Forum, part of Touchstone Theatre’s **Festival UnBound 2020**, September 19. You can view Somak reading his work [here](#) at min. 34:12.

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*I first became interested in water availability and its sustainability when I joined the Freedom High School Robotics team in 2017 and worked on addressing hydrodynamics problems as part of our project. How we find water, transport, use, or dispose of it was the theme of the 2017 FIRST Lego League. At that time, I learned by researching on the internet that I am fortunate to be part of Bethlehem where the water quality is much better than other parts of Northeastern America. We visited the local recycling plant to learn how wastewater is recycled. Recently I got the opportunity to research more on Bethlehem’s drinking water quality. I received some valuable information from Ed Boscola, Director of the Bethlehem Department of Water and have tried documenting it through this paper. Thank you to Ms. Elisabeth Cichonski and Professor Gallagher for guiding me in every step of the way, and to my AP U.S. History teacher, Mrs. Roman, for making this possible.*

### Water Quality and Sustainable Development of Bethlehem

**Somak Roy**

This paper is meant to raise awareness on the many potential threats to our water supply. The main points of concern are with such contaminants as trihalomethanes and lead, and the largest concern of all,

the potential impacts of the expanding shale gas industry in Pennsylvania and, in particular, the chemicals used in fracking.

The City of Bethlehem's water comes entirely from surface sources, namely the Wild Creek Reservoir and the Penn Forest Reservoir in a watershed that covers 17 square miles. This primary water supply is located 22 miles north of the City. The Tunkhannock Creek and Monroe County provide a supplemental supply of water to the Penn Forest Reservoir.

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.



Contaminants that may be present in source water before the city treats it include Organic chemical contaminants, including synthetic and volatile organic chemicals, which are by-products of industrial processes, and can also come from gas stations, stormwater runoff, and septic systems.

### **Trihalomethanes**

From 2015 to 2019, chromium, hexavalent chromium, and strontium levels have been consistently on the lower end of the allowable spectrum, as shown in the consumer reports. However, trihalomethane levels have been on the high end, and the acceptable ranges set by the EPA are constantly changing. Trihalomethanes are a chemical group that are a byproduct of mixing chlorine and organic matter and are related to fracking wastewater. Wastewater generated by hydraulic fracking is known to have high amounts of trihalomethanes that are still present even after the water treatment process. This chemical has been proven to have such negative health effects as various forms of cancer.

Bromodichloromethane is part of the family of the chemicals known as trihalomethanes which are regulated by the Pennsylvania Department of Environmental Protection and are monitored and included in the Consumer Confidence reports. It is important to ask why the allowable range of trihalomethanes is changing every year. Could this range be changing to accommodate increases in concentrations in source water?

## **Lead**

In 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR). [2] Until 2019, when lead jumped from 2.0 -7.0 ppb, the level of lead and copper in Bethlehem was relatively constant and had been since 2013. [Table 2] Although the levels are still significantly below the Recommended Exposure Limit established by the National Institute of Occupational Health and Safety (NIOSH), it's important to ask what happened in 2019. Why did the level of lead increase and how do these fluctuations reflect human behavior?

The treatment technique for the EPA rule requires systems to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 ppb or copper concentrations exceed an action level of 1.3 ppm in more than 10% of customer taps sampled, the system must undertake several additional actions to control corrosion. If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children.

## **Hydraulic Fracturing or Fracking**

In 2012, Pennsylvania Governor Tom Corbett signed Act 13, which permits most oil and gas operations in all the state's zoning districts, including ones with schools, parks, and hospitals. President Barack Obama authorized the creation of a high-level federal agency to coordinate shale gas production, a rapidly growing industry likened to a 21st-century gold rush. Over the next two decades more than 50,000 fracking wells are expected to open in Pennsylvania alone. Bethlehem will surely be affected by this; however, extensive studies have not yet been done so that we can accurately predict the impacts on our water quality.

Hydraulic fracturing, or fracking, is the method being used to extract natural gas from Pennsylvania's Marcellus Shale geological formation. It injects water, sand, and chemicals deep underground to break up the shale and allow the gas to be collected. The process also creates wastewater, known as flowback, that contains chemicals used in the fracking mixture, as well as salts, metals, radionuclides, and hydrocarbons from the target rock formation.

Fracking is controversial and is banned in New York, as well as places like Vermont and some European countries. The Pennsylvania natural gas industry has also given rise to proposals such as the [PennEast Pipeline](#) (gas pipeline between Martin's Creek and Philadelphia), which is designed to expand the domestic market for fossil fuels, which have alarmed environmentalists.

Dozens of children and young adults have been diagnosed with Ewing sarcoma and other forms of cancer in a four-county area outside Pittsburgh where energy companies have drilled more than 3,500 wells since 2008. Yet a 2015 study of Northeastern Pennsylvania published by the Environmental Protection Agency indicated that there was no evidence of fracking fluids contaminating wells and springs. These results are dated and may not accurately reflect some of the latent effects of the gas industry on local water sources. We need new studies with existing sample location data points and with new location data points.

Awareness is important, in particular, wider public awareness and better understanding of these impacts. Some positive steps are already being taken to keep our water safe. In November 2019, Pennsylvania Gov. Tom Wolf said his administration will spend \$3 million on a pair of studies to explore the potential health effects of the natural gas industry. At the water recycling plant in Lycoming County, for instance, a facility where wastewater is efficiently treated and studied, some shale gas producers are trying to protect the environment by collecting the fracking fluid and sending it to actual waste facilities.

Recycling and reusing shale-produced water as initiated by the Marcellus shale industry is now the standard practice of Pennsylvania shale companies in order to lessen the environmental impact of the shale industry. However, it is baffling to see how few studies are done with the

600 chemicals used in fracking and their effect in drinking water. Given this information, one can not conclude that fracking will have no impact on the Bethlehem water supply in the future.

Just like for the 600 chemicals used at fracking sites, more research must be done on chemicals such as trihalomethanes to fully understand their potentially harmful impacts to the human body. Sudden increases in contaminant levels, such as the elevated concentration of lead, should become a top priority. Our water may be safe for now, but in order to ensure that this remains true, we all need to be aware of what can and will taint our water supply.

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14. <https://cen.acs.org/articles/92/web/2014/09/Fracking-Wastewater-Encourage-Formation-Toxic.html>

## Appendix

Following 3 tables are all generated using data provided in consumer confidence report of water-sewerage in Bethlehem, PA [1]

	Chromium Range: 0.16 – 0.33 µg/L	Chromium Hexavalent Range:0.050 – 0.080 µg/L	Strontium Range: 10.8 – 15.4 µg/L	Trihalomethanes ppb	Trihalomethanes (range of detection)
2019	0.24	0.064	11.18	56	18-66
2018	0.27	0.066	12.25	57	27-59
2017	0.27	0.066	12.25	58	21-70
2016	0.27	0.066	12.25	60	28-82
2015	0.27	0.066	12.25	44.6	16.7-62.5
2014	NA	NA	NA	38.3	16.7-44.3

Table 1: Chromium, Chromium 6, Strontium, Trihalomethanes presence in water due to corrosion of household plumbing

	Lead (ppb)	Copper (ppm)
2019	7.0	0.093

2018	2.0	0.107
2017	2.0	0.107
2016	2.0	0.107
2015	2.0	0.100
2014	2.0	0.100
2013	2.0	0.100

Table 2: Lead and Copper in Drinking Water in Bethlehem, PA

	Turbidity NTU (detected level)
2019	0.045
2018	0.044
2017	0.058
2016	0.35
2015	0.289

2014	0.290
2013	0.383

Table 3: Turbidity of Drinking Water in Bethlehem, PA