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Gas Drilling's Environmental Threat

Fracking

The promise of abundant natural gas is colliding with fears about water contamination.

New Study: Fluids From Marcellus Shale Likely Seeping Into PA Drinking Water

A drilling site in South Montrose, Pa. (Spencer Platt/Getty Images)

by Abrahm Lustgarten
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New research has concluded that salty, mineral-rich fluids deep beneath Pennsylvania's natural gas fields are likely seeping upward thousands of feet into drinking water supplies.

Though the fluids were natural and not the byproduct of drilling or hydraulic fracturing, the finding further stokes the red-hot controversy over fracking in the Marcellus Shale, suggesting that drilling waste and chemicals could migrate in ways previously thought to be impossible.

The study, conducted by scientists at Duke University and California State Polytechnic University at Pomona and released today in the Proceedings of the National Academy of Sciences [1], tested drinking water wells and aquifers across Northeastern Pennsylvania. Researchers found that, in some cases, the water had mixed with brine that closely matched brine thought to be from the Marcellus Shale or areas close to it.

No drilling chemicals were detected in the water, and there was no correlation between where the natural brine was detected and where drilling takes place.

Still, the brine's presence – and the finding that it moved over thousands of vertical feet -- contradicts the oft-repeated notion that deeply buried rock layers will always seal in material injected underground through drilling, mining, or underground disposal.

"The biggest implication is the apparent presence of connections from deep underground to the surface," said Robert Jackson, a biology professor at the Nicholas School of the Environment at Duke University and one of the study's authors. "It's a suggestion based on good evidence that there are places that may be more at risk."

The study is the second in recent months to find that the geology surrounding the Marcellus Shale could allow contaminants to move more freely than expected. A paper published [2] by the journal Ground Water [3] in April used modeling to predict that contaminants could reach the surface within 100 years – or fewer if the ground is fracked.

Last year, some of the same Duke researchers [4] found that methane gas was far more [5] likely to leak into water supplies in places adjacent to drilling.

Today's research swiftly drew criticism from both the oil and gas industry and a scientist on the National Academy of Science's peer review panel. They called the science flawed, in part because the researchers do not know how long it may have taken for the brine to leak. The National Academy of Sciences should not have published the article without an accompanying rebuttal, they said.

"What you have here is another case of a paper whose actual findings are pretty benign, but one that, in the current environment, may be vulnerable to distortion among those who oppose this industry," said Chris Tucker, a spokesman for the gas industry trade group Energy In Depth. "What's controversial is attempting to argue that these migrations occur as a result of industry activities, and on a time scale that actually matters to humanity."

Another critic, Penn State University geologist Terry Engelder, took the unusual step of disclosing details of his review of the paper for the National Academy of Sciences, normally a private process.

In a letter written to the researchers [6] and provided to ProPublica, Engelder said the study had the appearance of "science-based advocacy" and said it was "unwittingly written to enflame the anti-drilling crowd."

In emails, Engelder told ProPublica that he did not dispute the basic premise of the article – that fluids seemed to have migrated thousands of feet upward. But he said that they had likely come from even deeper than the Marcellus – a layer 15,000 feet below the surface – and that there was no research to determine what pathways the fluids travelled or how long they took to migrate. He also said the Marcellus was an unlikely source of the brine because it does not contain much water.

"There is a question of time scale and what length of time matters," Engelder wrote in his review. In a subsequent letter to the Academy's editors [7] protesting the study, he wrote that "the implication is that the Marcellus is leaking now, naturally without any human assistance, and that if water-based fluid is injected into these cross-formational pathways, that leakage, which is already 'contaminating' the aquifers with salt, could be made much worse."

Indeed, while the study did not explicitly focus on fracking, the article acknowledged the implications. "The coincidence of elevated salinity in shallow groundwater... suggests that these areas could be at greater risk of contamination from shale gas development because of a preexisting network of cross-formational pathways that has enhanced hydraulic connectivity to deeper geological formations," the paper states.

For their research, the scientists collected 426 recent and historical water samples -- combining their own testing with government records from the 1980s -- from shallow water wells and analyzed them for brine, comparing their chemical makeup to that of 83 brine samples unearthed as waste water from drilling sites in the Marcellus Shale.

Nearly one out of six recent water samples contained brine near-identical to Marcellus-layer brine water.

Nevertheless, Jackson, one of the study's authors, said he still considers it unlikely that frack fluids and injected man-made waste are migrating into drinking water supplies. If that were happening, those contaminants would be more likely to appear in his groundwater samples, he said. His group is continuing its research into how the natural brine might have travelled, and how long it took to rise to the surface.

"There is a real time uncertainty," he said. "We don't know if this happens over a couple of years, or over millennia."