EDITOR'SFOCUS

removing a RADIUM 88 risk

By Clare Pierson

Many towns in Northeastern Illinois that do not draw their drinking water from Lake Michigan rely on deep well water to serve their communities; however, naturally occurring radium is found in much of this well water, leaving many of these towns in direct violation of federal regulations. Under current U.S. Environmental Protection Agency (EPA) regulations, utilities must keep radium levels under 5 pico curies (pCi) per liter of water.

Sycamore's two wells once produced an average of 8.25 pCi/L of radium in drinking water. Now they produce 0.02 pCi/L or less.

City eliminates radium contamination problem

The EPA projects there is a cancer risk for one to three people per 10,000 exposed at above the maximum contaminant level of 5 pCi/L. High levels of radium over a long period of time could expose a person to osteosarcoma, bone cancers, leukemia and lung cancer.

This is the kind of information that led residents of Sycamore, Ill., to worry when they learned that the city's wells—which draw water from deep sandstone aquifers at an average rate of 1,200 gal per minute (gpm)—were producing radium levels averaging 8.25 pCi/L.

Alternative Options

Mike Swedberg, superintendent of water for the city of Sycamore's Public Works department, knew the city had to fix this problem, but the question remained of how to do it. One common option for a utility has been to flush the radium to its wastewater plant, which typically is not as heavily regulated for radium as drinking water plants. Filtering it into sludge to be used as fertilizer in farms is another option. Yet these methods do not really get rid of the radium, they essentially just move it around.

"We really didn't want to just hand the problem over to our wastewater guys," Swedberg said.

A Vast Improvement

Sycamore officials consulted with officials of Elburn and Oswego, Ill.—nearby towns that previously hired and recommended Water Remediation Technology (WRT), a water treatment company based in Wheat Ridge, Colo., that specializes in contaminant removal.

WRT offered Sycamore a 20-year contract for which it would provide its Z-88 Radium Removal Process technology. This technology allows water to pass in an upflow mode through a fluidized bed of media in treatment columns, where radium is removed by ion exchange. According to WRT, the process uses a special conditioned type of Zeolite that is effective in removing radium without altering the water's quality. Radium accumulates on the media, and WRT will periodically remove it and permanently dispose of it in a licensed facility in Hanford, Wash., which contains and disposes of radioactive materials.

In general, "the frequency with which WRT will exchange the media is determined by several factors," said Tom Kaiser, Midwest regional sales manager for WRT. "The amount of radium in the water and the volume of water that passes through the system are the key determining factors."

Swedberg said the numbers for the first quarter of 2008 project that the first well is producing just 0.02 pCi/L of radium, and the second well is producing nondetectable amounts. When the buildup of radium on the media reaches close to 5 pCi/L, WRT comes to replace the media

and trucks the radium to Washington state for disposal.

Overcoming Challenges

In order to install this technology, the city had to vote to construct two brand new well additions. Convincing eight council members to vote unanimously to complete this project was not easy, and Swedberg was proud to have done it.

Swedberg said the process has been lengthy, with the pilot study taking place in 2003 and the new technology going online in 2007. The estimated purchase of the systems and reconstruction of the two wells cost about $1.4 million. "It seemed really expensive at first, but it is actually middle of the road" when looking at all the options together, he said.

"The biggest challenge from our side was skepticism about this relatively new technology, and that's why we did a pilot study first," Swedberg said. "And the cost was also a hurdle, but lessened by the fact that we did not have to handle the radium buildup or hire new operators to run the system."

WRT usually operates with long-term contracts such as 20 years because the company contends they downsize costs a bit for the utilities. "The advantage of locking into a long-term contract is that you know what the costs will be, and WRT guarantees the performance of the system during the 20-year contract," Kaiser said.

Ultimately, WRT's technology proved to be the best option for Sycamore because there is no chemical handling involved for city staff, there are no liquid waste streams or disposal issues and no additional plant operators are needed to run the systems. Swedberg said there has been a strong positive reaction from the community to the city's willingness to take action and seek out a fitting solution. WWD

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Digging Deeper

By Clare Pierson

In December 2000, the U.S. EPA revised old regulations and published new ones for radionuclides in drinking water. The rule was deemed applicable to community water systems—water systems that serve at least 15 connections or 25 residents annually—across the country, set new maximum contaminant levels (MCLs) for uranium and revamped the monitoring requirements for Radium 226 and 228.

The EPA revised the radionuclides regulation, which had been in effect since 1977. The agency also issued a standard for uranium at 30 µg/L. The new standards were: combined Radium 226/228 of 5 pCi/L; a gross alpha standard for all alphas of 15 pCi/L (not including radon and uranium); and a combined standard of 4 mrem/year for beta emitters.

These rules were significant because it ensured that all customers of community water systems received drinking water that met MCL levels. Under the 1976 rule, a water system's multiple entry points to a distribution system were not required to be tested; only a "representative point" to the system had to be tested. The goals of the 1976 rule were to protect the "average customer," whereas the 2000 rules ensured all customers would be protected.

The EPA also projected that the new requirements would help prevent 0.4 cancer cases per year from effects of radium, and 0.8 cancer cases per year from effects of uranium.

In 2004, the EPA approved the use of plasma mass spectrometry technology to analyze and determine uranium levels in drinking water. That same year, the agency also revised the detection limit for radium to 1 µg/L, made minor editorial changes to the 2000 radionuclides rules and mandated that public education brochures be sent to facilities that were exceeding lead and copper regulation limits in their drinking water.

Source: U.S. EPA website