VIEWS & VISIONS

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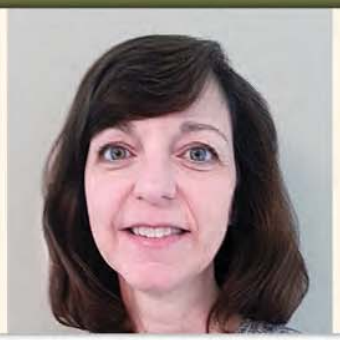

The Safety of Selenium: How Much is Too Much?

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Jennie L. Henthorn is the owner of Henthorn Environmental Services, formed in 2007 and located in St. Albans, West Virginia. The company assists a variety of clients, including industrial, mining and manufacturing businesses, as well as wind and coal project developers, financial institutions and trade organizations.

Ms. Henthorn has more than 20 years of experience in environmental compliance and permitting. She works primarily in the areas of environmental regulation, water quality standards, and air and water permitting. Before forming Henthorn Environmental Services, she provided technical support for Bowles Rice in environmental matters.

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The coal industry faces many challenges due to increasingly stringent environmental regulations and restrictive interpretations by our courts. Of these challenges, selenium continues to be one of the most difficult water issues to resolve.

The Clean Water Act requires states to develop and implement water quality standards, including water quality criteria to protect the uses of the states' waters. The United States Environmental Protection Agency prepares recommended water quality criteria for individual pollutants. While states may develop their own water quality criteria, it is common practice for states to adopt the EPA's recommended criteria.

West Virginia and many other states adopted the EPA's recommended aquatic life criteria for selenium. These criteria are set at five parts per billion (ppb) for chronic exposures and 20 ppb for acute exposures. The selenium criteria are implemented by two primary methods. First, the selenium criteria are used to assess the water quality of our state's lakes and streams. If the selenium concentration in a body of water exceeds the selenium criteria, then the stream is considered impaired for that parameter. Second, the selenium criteria are implemented directly in water discharge (NPDES) permits as numeric limits for certain mining operations.

Other elements are far more prevalent in mining discharges, as they commonly occur in the soils and rocks encountered while mining. For example, aluminum (eight percent) and iron (five percent) are the third- and fourth-most abundant elements in the Earth's crust. This stands in stark contrast to selenium, which is present at a meager concentration of 0.000005 percent and is far less abundant that copper, lead, silver, zinc and many other elements. So, why the fuss?

While selenium is not ubiquitous, it is relatively abundant in certain strata encountered by mining. In West Virginia, strata with selenium concentrations above one part per million (ppm) are considered to be potential sources of elevated selenium concentrations in water. Mines that will encounter these strata are required to have special selenium isolation plans. The West Virginia Department of Environmental Protection (DEP) released a revised Selenium Implementation Guidance on December 30, 2013, with permitting procedures to reduce the potential for new mining activities to cause or contribute to selenium water quality criteria violations.

Once released to the environment, selenium is extremely difficult to treat and remove from the water. Because selenium is not a metal, conventional water treatment systems at mines are ineffective for selenium removal. Some mines have been required to install advanced water treatment systems with high capital and operating costs. The waste treatment residue can be difficult and costly to dispose. Other mining operations have seen success with passive treatment systems called bio reactors, which utilize anaerobic microbes to remove selenium from the water column. While these systems have lower operating costs, bioreactors are still very expensive to install and to maintain. They also require significant retention times and may not be

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capable of handling high flows during storm events.

Scientific evidence strongly suggests that the current selenium criteria are overprotective of aquatic life. In particular, the EPA's chronic selenium criterion is very questionable, as the criterion is based on interpretation of data from a single lake with high selenium concentrations. The EPA-recommended criterion departed from the actual scientific data developed by laboratory studies, which suggest a much higher chronic selenium criterion is appropriate.

The EPA prepared draft revisions to its selenium criteria in 2004, but did not finalize the numbers following public comment. In 2013, the EPA approved a revision to Kentucky's chronic selenium criterion, which is now based upon fish tissue concentrations instead of water concentrations. The EPA has stated that it soon plans to release new national recommended selenium criteria, which also are expected to involve fish tissue concentrations.

West Virginia is currently implementing a comprehensive selenium study in state waters. In its 2013 session, the West Virginia Legislature adopted House Bill 2579, which requires the DEP to propose a new selenium criterion for Legislative approval within two years. The DEP recently ordered certain mining companies to conduct a study that includes chemical speciation of selenium discharges and a fish population survey and monitoring plan at numerous locations throughout the state. The study will be utilized to develop a new chronic selenium criterion for consideration by the Legislature.

The selenium water quality criteria will be the source of activity and controversy for many years. Kentucky's revised chronic criterion has received significant response, both positive and negative. The implementation of fish tissue criteria in NDPES permits requires careful consideration and adequate data.

In the meantime, the coal industry will continue to work on effective measures to treat selenium and to prevent its release to the environment from new mining activities. V