The Perchlorate Challenge

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Whether it comes from rocket fuel, organic Chilean fertilizer, or natural deposits, soils and groundwater impacted by perchlorate may pose health risks to sensitive populations. Although further research is required to determine exactly what concentration of perchlorate contamination exceeds safe levels, suggestions of interrupted nervous system development and thyroid tumors are enough to cause concern. During this year's Perchlorate Platform Session, speakers commented on the nature of the chemical and the challenges involved with detecting and treating perchlorate-contaminated sites.

Perchlorate taints water in at least 22 states, and a little bit goes a long way. One metric ton of perchlorate can contaminate 32 billion gallons of water, equivalent to all the water in Arizona's Lake Mead.

"It dissolves easily in water," says Paul Rakowski of the Naval Facilities Engineering Command (NAVFAC) and moderator of the Perchlorate Session, "which means it can move very quickly and it takes a long time to degrade." And when contaminated water is used to irrigate fields, perchlorate may find its way into various crops and agricultural products.

Platform Session speakers reported on a variety of methods for treating perchlorate-contaminated water, including in situ treatments that exploit naturally-occurring perchlorate-reducing bacteria and ex situ methods involving ion exchange. However, the currently available methods are very complex and costly, according to Harry Van Den Berg of ENSR International.

The growing concern over perchlorate was officially acknowledged by the EPA in 1999 when the agency added it to the Unregulated Contaminant Monitoring Rule list. But, "just finding it is very difficult," notes Rakowski.

The EPA-approved method for detecting perchlorate in drinking water is limited in its specificity and sensitivity, says Ed Corl of NAVFAC's Atlantic Division. The approved method can detect perchlorate to a concentration of 4 parts per billion (ppb), but regulatory agencies in some states have already listed provisional action levels as low as 1 ppb. Therefore, Corl says, "the currently approved method may not meet data quality objectives for some studies."

The concern over perchlorate has prompted researchers to develop highly sensitive detection methods. New analytical techniques involving liquid chromatography and mass spectroscopy can detect perchlorate at concentrations well below the provisional 1 ppb action level, reports Jim Krol, a Senior Application Chemist with the Massachusetts-based Waters Corp. And improved analytical methods have significantly increased the frequency of perchlorate detection. "Our analytical techniques for finding it have become more specific," says Rakowski. "Now we seem to be finding more widespread low levels of perchlorate."

The source of some contaminated sites are manufacturers and users of perchlorate salts: military bases, aerospace installations and defense contractors that build rockets. Perchlorate salts are also used to manufacture roadside flares, airbag inflators, metal finishing and matches. However, a portion of the perchlorate found in the U.S. is believed to be naturally occurring.

One confirmed natural source of perchlorate is the sodium nitrate fertilizer derived from Chilean caliche, a crusty, nitrate-rich sediment found in the Atacama desert of northern Chile. "Perchlorate plumes from natural sources seem to be coming primarily from the liberal use of Chilean caliche-derived fertilizer [in the U.S.] between 1900 and 1950," says Paul Hatzinger of Shaw Environmental, "but there may also be other natural sources of perchlorate as yet unknown."

"As we go through the scientific process, we will discover that there is an impact from natural perchlorate as well as man-made perchlorate," says Rakowski. This will have to be taken into consideration when planning remediation efforts, he said.

Proceedings Published, Soils Conference Between the Covers

Proceedings from the International Conference on Soils, Sediments and Water will be published by the renowned scientific publishing company, Springer (visit www.springeronline.com for order information).

The proceedings will be published under the title, "Contaminated Soils, Sediments and Water Volume 10," edited by Edward Calabrese, Paul Kostecki and James Dragun. This edition will contain more than 30 technical papers, covering a wide range of environmental issues, including: Environmental Fate; Heavy Metals; Modeling; MTBE and Oxygenates; Regulatory; Remediation; Risk Assessment and Remedial Approaches Toward Restoration and Management of Contaminated Rivers; and Site Assessment.

Authors contributing to this volume come from government agencies, academic institutions, the consulting community and industrial companies. This important volume documents the state of environmental science and provides perspective on where we as an industry have come from. This and preceding volumes of Contaminated Soils, Sediments and Water, consolidate the valuable technical information presented at this conference in order to stimulate the scientific, engineering and consulting alliances and widespread collaboration that will continue to move our field ahead.

By Loren Walker www.L2W.cc