

Presentation Title:

How humans affect the release of naturally occurring arsenic

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Abstract:

Arsenic occurs naturally in groundwater throughout New England. One recent survey found 31% of private water supplies exceeded the 10 ug/L maximum drinking water standard. While research demonstrates arsenic concentrations may be correlated with bedrock lithology, there are numerous reports of elevated arsenic concentrations resulting from human activity. Perhaps the most common release mechanism occurs when arsenic bearing insoluble iron and manganese oxides are dissolved when a normally aerobic groundwater system becomes anaerobic. Throughout New England anaerobic conditions may develop in groundwater wherever the organic loading to groundwater consumes available dissolved oxygen.

In addition to describing the biogeochemical mechanism responsible for the anaerobic release of arsenic, we provide examples where arsenic concentrations increased significantly in response to leaching of a variety of biodegradable organic compounds. Our experience demonstrates organic loading from a variety of activities including petroleum releases, the leaching of biosolids used to manufacture topsoil and the release of landfill leachate may create the anaerobic conditions capable of releasing naturally occurring arsenic.

Another mechanism for mobilizing naturally occurring adsorbed arsenate is to raise the pH of the ground water above 8. We have seen numerous instances of this type of arsenic plume at waste remediation sites. Leaching of concrete structures or rubble, or wood ash dumping may also be effective.

With an appreciation of the mechanism responsible for the release of naturally occurring arsenic, we also highlight a variety of common human activities that by their very nature increase the amount of organic carbon leached to groundwater and are therefore capable of releasing arsenic. Although it is often difficult to unravel the geochemical mechanism responsible for the arsenic observed in a particular water supply, an understanding how increased organic carbon loading may alter natural arsenic concentrations will lead to a greater awareness of how humans alter the environment.