What Is the Quality of Groundwater Within the Uranium-Mineralized Zone ?

Pre-mining historical data indicate that uranium-mineralized zones at all *in situ* mining sites in South Texas meet the definition of an Underground Source of Drinking Water (USDW – a water-bearing geologic unit that contains groundwater with less than 10,000 milligrams per liter of total dissolved solids). However, these data also indicate that the groundwater in the uranium-mineralized zones at these sites does not meet primary drinking water standards for a variety of groundwater constituents, particularly for radioactive radium 226. Uranium mineralization affects only the localized groundwater in contact with the mineralized zone. Away from the uranium-mineralized zone, the groundwater quality is not affected by the mineralization.

Pre-mining historical data are site-specific groundwater quality data that were collected at each permitted site to establish pre-mining groundwater quality, or what is referred to as baseline groundwater quality. Baseline groundwater quality data at each authorized production area were used to establish baseline groundwater quality.

In situ uranium mining further affects the quality of groundwater within the uranium-mineralized zone. About 75 to 80% of the uranium in the mineralized zone is dissolved and removed using *in situ* techniques. In addition to dissolving uranium from the mineralized zone, injected mining solutions dissolve other constituents from the aquifer material, including arsenic, molybdenum, cadmium, calcium, and radium 226. Normally, groundwater is under chemically-reducing conditions (i.e., low oxygen levels). Under such conditions, uranium solubility is greatly decreased. Within a zone of uranium mineralization, however, the concentration of uranium in the mineralized zone will be high enough so that some of the uranium will be dissolved into the groundwater, even under these reducing conditions. During *in situ* mining, the oxygen in the mining fluids reacts with the uranium minerals, dissolving the uranium into the mining fluid. This dissolved uranium then reacts with the bicarbonate ions to form a chemical complex, which keeps the uranium in solution. This process also results in dissolution of other constituents into the mining fluid. Radium 226 dissolution into the mining fluid results from increased chloride ion concentrations in the mining fluid.

References:

- Texas Commission on Environmental Quality (TCEQ) Source Material Recovery and By-Product Material Disposal, https://www.tceq.texas.gov/permitting/radmat/uranium/uranium.html
- TCEQ In Situ Leach and Conventional Uranium-Recovery Methods, https://www.tceq.texas.gov/permitting/radmat/uranium/process.html
- TCEQ Regulations for Class III Wells, http://texreg.sos.state.tx.us/public/readtac$ext.ViewTAC?tac_view=5&ti=30&pt=1&ch=331&sch=E&rl=Y
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- U.S. NRC NUREG 6870: Consideration of Geochemical Issues in Groundwater Restoration at Uranium In-Situ Leach Mining Facilities, http://www.nrc.gov/reading-rm/doc-collections/nuregs/contract/cr6870/cr6870.pdf
- Texas A&M AgriLife Extension Service (TAES) *Drinking Water Problems: Radionuclides* (B-6192), http://www.agrilifebookstore.org/default.asp

For additional Frequently Asked Questions (FAQs) related to groundwater quantity, groundwater quality, septic systems, water wells, administrative entities, and publications, visit the Texas Groundwater Protection Committee's FAQ webpage at http://tgpc.state.tx.us/frequently-asked-questions-faqs/.