

# Naturally Occurring Radioactive Materials in the Southwestern Copper Belt of Arizona

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## ABSTRACT

The U.S. Environmental Protection Agency (EPA) has been working to better understand the nature and extent of naturally occurring radioactive materials (NORM) that may become concentrated at copper mining sites. This EPA paper reviews the current literature about this potential for NORM. The literature has reported uranium and thorium in minerals associated with porphyry copper deposits in the southwestern copper belt of the U.S. Mining and processing operations may concentrate radioactive materials. Samples taken by the Arizona Department of Environmental Quality (ADEQ) from several copper mines indicate that NORM has been found to occur above background levels in ground water and in process waste streams. ADEQ data also shows evidence of NORM in a contaminated ground water plume that originates from a copper mine. The data suggest that dump leaching operations at other copper mines tend to extract and concentrate the soluble radioactive materials in the leachate, with typical increases over background levels of about 100%. These results imply that technological advances in the dump leaching and solvent extraction - electrowinning (SX-EW) procedures, and the practice of recycling raffinate, may concentrate NORM. Adequate radiological characterization of mine wastes has not been conducted to determine the level and distribution of NORM at copper mine sites in the U.S. More definitive data on this subject are needed.