

Mine Waste as a Resource: Critical Minerals in Mine Wastes in New Mexico U.S.A.

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There are tens of thousands of inactive mine features throughout the United States (including coal, uranium, metals, potash, and industrial minerals). Many of these mines have existing mine wastes, generated during mineral production, which could have potential for critical minerals, especially since the actual mineral production was generally for precious and base metals and not critical minerals. The first step is to inventory and prioritize the mine wastes. Second step is to sample, characterize and estimate the quantity of critical minerals in these mine wastes to determine if there is enough material that could be reprocessed. Characterization includes determining the type of deposit, mineralogy, geochemistry, and size of the mine waste. The mine history of the area also needs to be summarized to better understand the deposits. In New Mexico (southwestern United States), mine wastes including waters are being characterized for critical minerals. Tonnage estimates of the important critical minerals are calculated. For example, the Copper Flat tailings contains an estimated 402,900 kg of Cu, 1,280 kg of Bi, 6,880 kg of Co, 15,600 kg of Ga, and 53,400 kg of Zn. The Black Hawk district contains unusual arsenide five-element veins (Ag, Ni, Co, As, U, Bi and other elements) and mine waste samples are elevated in Ag (>200 ppm), Co (290 ppm), Ni (2,130 ppm), and Zn (8,463 ppm). In New Mexico, there are an estimated 94 million tons of uranium tailings that contain vanadium, cobalt, arsenic, and possibly rare earth elements. Even mining-influenced waters could have critical minerals. Future mining of mine wastes that potentially contain critical minerals will directly benefit the economy of the local areas. Possible re-mining of mine wastes could clean up these sites and pay for reclamation. These characterization projects included training of younger, professional geologists and students in economic and reclamation geology.