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Total and Bioaccessible Metal Concentrations in River Flood Sediment Deposits in Two Urban Communities Following Hurricane Ida

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Anthropogenic climate change has resulted in extreme rainfall and flooding on both a global and local scale. Flooding of urban areas can redistribute historical and present-day soil, sediment, and water contamination across affected areas and leave behind a sediment later laced with a suite of metals. This sediment layer poses a direct human health risk to the residents who live within these affected communities as well as the workers tasked with its cleanup. This study evaluated relative differences of total (Al, Fe, Co, Cr, Ni, Zn, Cu, As, Ba, Pb) and human bioaccessible (Zn, Cu, As, and Pb) metal concentrations in river flood sediment deposits in two urban communities in Philadelphia, P.A. (U.S.) (Manayunk and East Falls), which border the Schuylkill River, and have relative differences in historical industrial land use (Manayunk >>East Falls). Sediment deposits were collected immediately following a near record flooding event associated with the remnants of Hurricane Ida in September 2021. Statistically higher concentrations of Cr, Fe, Cu, Zn, As, and Pb in the Manayunk neighborhood suggests remobilization of contaminated soils as well as sediments from a historical industrial canal. Statistical analysis results also suggest the influence of roadway derived materials. Total metal and bioaccessible lead concentrations in excess of regulatory thresholds for residential soils suggests the sediments pose a substantial health risk to those who live and work in these areas. Collectively, the study results elucidate the public health risk associated with the deposition of flood sediment in urban areas.