ABSTRACT: The mineral sector in Brazil takes an important role in its GDP (Gross Domestic Product) as the country possesses a mineral potential equivalent or higher than that of other countries worldwide. Open-pit mines are widely spread in Brazil, like those located at Araxá city, Minas Gerais State (MG), for exploiting niobium and phosphate, which are mineral commodities mines of large/medium size well-known at the international level. Barreiro area at Araxá city has been subjected to intense debate because of environmental pollution related to intense mining activities developed for the phosphate and niobium exploitation. Anthropogenic inputs involving the barium release into waters occurred there by the early 1980s because of a leakage occurring at one tailings dam as the adoption of synthetic membrane for the dam waterproofing only started in 2006. In this study, (radio)chemical analysis was performed for samples collected at Barreiro area, which consisted on rainwater, water and a 35-cm depth sediments core of Grand Hotel lake, and groundwater of Dona Beja and Andrade Júnior springs. This novel (radio)chemical database allowed focusing the major pathways for the constituents transport there, which are accompanied by information on possible modifications along the time as provided by the use of the $^{210}$Pb chronological method. The barium content in the water sample of Grand Hotel lake and leachates of the sediments sections exceeded the WHO guideline value of 0.7 mg/L in drinking water. The mean value obtained for the Cr, Zn, Cu and Pb concentration in the sediments sections was above of the probable effect level (PEL) guideline established by the Canadian Environmental Council for freshwater, which corresponds to 90, 315, 197 and 91.3 µg/g, respectively. Calculated mobility indices (in kg.m$^{-3}$) indicated tendency of enhanced transfer into the liquid phase of the (earth) alkaline elements (Na, K, Ca, Mg) and Cl that exhibited the highest value (118 kg/m$^3$), confirming its conservative behavior in solution. Mobility indices determined for Al, Fe, Ba, Sr, Cr, Zn, Cu and Ni in the dissolved and suspended solid phases indicated their trend to remain adsorbed in the solid phase and also pointed out the preference of the (earth) alkaline elements Na, K, Ca, Mg, Sr, Ba and Sr to remain dissolved instead in the suspend solids phase. The Constant Rate of $^{210}$Pb Supply (CRS) model allowed determine an average sedimentation rate of 1.49 g.cm$^{-2}$ yr$^{-1}$ at Barreiro area that implied on deposition times of up to 70 years. The historical trends of BaO, Nb$_2$O$_5$, ThO$_2$ and REEs (La, Ce, Nd) concentrations according to the ages estimated by the CRS model showed a concentration peak around the year 1973 that could be associated with anthropogenic inputs occurring there.

KEYWORDS: ARAXÁ CITY, BARREIRO AREA, $^{210}$Pb-CHRONOLOGICAL METHOD.