

ACIDITY-SALINITY RELATIONSHIP IN GOLD MINE TAILINGS IN NOPIMING PROVINCIAL PARK, MANITOBA, CANADA

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Electromagnetic surveys were done at the Central Manitoba gold mine-tailings in Nopiming Provincial Park, Manitoba, Canada to map the thickness and electrical conductivity of the tailings and to define spatial variations in pore-water salinity. Modelling of data collected using EM38, EM21, and EM34 instruments indicates that the combined thickness of the tailings and underlying peat bog material decreases from 5 m on the north side of the tailings to less than 1 m on the south side. The EM31 survey results identify areas of enhanced conductivity on sloping surfaces on the south side of the tailings pile. These areas are spatially correlated with zones of increased tailings acidity defined by sparse in situ pH measurements. The observations support the hypothesis that acidification of the tailings is due to differential settling during the deposition of carbonate and sulfide in the tailings, with higher proportions of sulphide occurring closer to the discharge outlet on the south side of the pile. In order to examine the relationship between electrical conductivity (or pore water salinity) and acidity in more detail, dense sampling was conducted along a 50 m long by 1 m deep grid crossing a zone of enhanced conductivity. Laboratory measurements of electrical conductivity and pH were made on a total of 52 tailings samples. The results show that the enhanced salinity and pH occurs within the oxidized upper part of the tailings and that the acidic material is exposed on the sloping surfaces. Plots of conductivity versus pH for the data set define a function relating the two parameters that can be used, along with conductivity models, to establish the 3-D distribution of the acidity in the tailings pile.

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