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Phosphate Resources Estimation Using Kriging and Geographic Information Systems

S. Jaber, K. Ibrahim, and M. Al-Muhtaseb

Department of Water Management and Environment, Faculty of Natural Resources and Environment, Hashemite University, Zarqa, Jordan (sjaber@hu.edu.jo)

This study aimed at developing methods for estimating phosphate resources indirectly and based upon information obtained from exploration boreholes in order to sustain their production and management, which is necessary to cover the growing national and international demands for phosphate fertilizers. The methodology consisted of selecting the best kriging models, based on their performance in the validation stage, to estimate the depth, thickness, and mass of the phosphate resources using geographic information systems by interpolating four surfaces representing the ground surface topography, the upper and lower surfaces of the phosphate layer, and phosphate grade. This methodology was tested on a phosphate layer detected in boreholes drilled in exploration site number 35 in Al-Abiad Mine in central Jordan. The total measured phosphate resources were found to be about 1.268 million metric tons. They existed at depths varied from 6.9 to 19.4 m below the ground surface and had thicknesses varied from 0.2 to 2.3 m. However, the accuracy of the results was scale-dependent. That is the proposed methodology works better for large areas where the phosphate resources exist at large depths and have large thicknesses and the number of the exploration boreholes drilled are large and the distances between the boreholes are small.