

Three-dimensional hydrogeologic modelling to simulate groundwater inflow at an abandoned underground coal mine in Korea

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The safety and environmental concerns should be addressed for sustainable mining operations, and one of the key issues is the prediction of the groundwater flow into underground mine workings. Prediction of the groundwater inflow requires a detailed knowledge of the geologic conditions, including the presence of major faults and other geologic structures at the mine site. The hydrologic boundaries and depth of the phreatic surface of the mine area, as well as other properties of the rockmass, are also provided. Various numerical models have been applied to develop hydrogeologic models at mine sites, and the MINEDW by Itasca is one of those groundwater flow model codes developed to simulate the groundwater flow related to mining.

Mine sealing is one of the usual methods to control mine water at abandoned mines. An experimental program has been undertaken to provide a practical procedure for sealing abandoned coal mines in Korea. Two abandoned coal mines were selected, and extensive geological and geophysical surveys were performed. Field hydraulic tests, such as pumping tests and packer tests, had also been conducted to measure the hydraulic conductivities of the rock mass. In this study, constructing three-dimensional hydrogeologic models of the study area are essential for design and installation of the stable adit-plug system. With the complete 3D model constructed, the rate of mine water rebound after the installation of the adit-plug system can be hypothesized. The maximum water pressure affecting the stability of the plug, and the long-term seepage problems, can also be estimated.