Importance of the Engineering Geological Model in Rock Slope Engineering

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This paper seeks to outline the interaction of engineering geology and rock mechanics in the slope design process. This interaction is best directed through the use of an engineering geological model which is a concept that is not well explained in standard texts on engineering rock mechanics and rock slope engineering. Often textbooks have an introductory chapter on geology which typically discusses the influence of geological factors on rocks and rock mass. However, the role of the engineering geological model in slope design is usually not addressed.

A key focus of model building in engineering geology is management of gaps and uncertainties in the site investigation and the resulting issues about accuracy and representativeness of the collected data. The modelling process is centred on the scientific method and employs the key ideas of heuristics and inductive reasoning. It is important the roles of the geologist and engineer are clearly communicated during each stage of project development including their contributions to the Conceptual, Observational, Geotechnical, Analytical and Construction model types.

In rock slope engineering the principal objective of the engineering geological model is identifying and understanding the geological controls on potential slope failure mechanisms. This understanding forms the basis for analysis and supports engineering decisions made in design. In particular the engineering geological model provides the analytical model geometry, informs the strength properties and groundwater conditions and explains the shape and nature of the failure path. This knowledge controls decisions on the most suitable methods to be adopted in engineering analysis.

Geological controls on the major components of the model for slope engineering are discussed including regional to project scale geological setting, rock mass, structure and water. The emphasis is on how these elements come together in the evaluation of the critical failure mechanism controlling slope design. This process is demonstrated for a number of mining and civil engineering projects in Australia, New Zealand and Southeast Asia.