

Fractured-bedrock Aquifer Studies Based on a Descriptive Statistics of Well-logging Data: A Case Study from the Dajia River Basin, Taiwan

Po-Yi CHOU, Shih-Meng HSU, Po-Jui CHEN, Jung-Jun LIN,
and Hung-Chieh LO

Geotechnical Engineering Research Center, Sinotech Engineering Consultants, Inc.,
Taipei, Taiwan; e-mails: poyi.chou@sinotech.org.tw (corresponding author),
shihmeng@sinotech.org.tw, ray@sinotech.org.tw, jjlin@sinotech.org.tw,
jaylo@sinotech.org.tw

Abstract

A simple descriptive-statistical approach is proposed for evaluating the transmissivity of fractured-bedrock under field conditions. Based on standard well logging and identification of structural discontinuities from borehole televiewer, the approach consists of four steps: (1) determination of discontinuity properties, namely the frequency of discontinuities and the ratio of open fractures along the borehole; (2) ranking the three well logs and the discontinuity properties into tertiles (high-to-low); (3) performing statistical analysis (F -test) for the three well logs to assess the significance of open fractures on the water-transmitting potential and then assigned a weighting factor; and (4) a semi-quantitative indicator, $RGVFO$, is obtained by multiplying all predictive indexes and weighting factors. It is a multi-criteria evaluation procedure that elucidates the quantitative and qualitative importance of all selected geophysical indexes. A high cross-correlation between transmissivity to $RGVFO$ value is found, which indicates that by a combined consideration of well logging and structural discontinuities, an appropriate estimate of bedrock water-transmitting potential can be derived.

Key words: fractured rocks, groundwater hydraulics, geophysical methods, geostatistics, Taiwan.