

Determination of Aquifer Geometry Through Geophysical Methods: A Case Study From Quetta Valley, Pakistan

Khurshaid ALAM¹ and Nasir AHMAD²

¹Geophysics Division, Geological Survey of Pakistan, Lahore, Pakistan
e-mail: khurshaidalam@yahoo.com

²Institute of Geology, University of the Punjab, Lahore, Pakistan
e-mail: envrnet@brain.net.pk

A b s t r a c t

Due to increase in population and agricultural activities, the aquifer of Quetta Valley is under tremendous stress and the water table is declining at an increasing rate. This situation necessitates evaluation of the aquifer system, for which information about geometry of the aquifer is a prerequisite. However, there are no drilling-to-bedrock data available; therefore, electrical resistivity, seismic reflection and gravity methods were employed to determine geometry of the aquifer. Interpretation of vertical electrical soundings provided information about the depth-to-bedrock at some specific points, whereas seismic reflection delineated bedrock topography along two lines. The depths to bedrock inferred from electrical resistivity and seismic reflection data were used as constraints in the modeling of gravity data. 2.75D gravity models were constructed along lines with a regular spacing. Map of depth-to-bedrock was prepared by contouring the depth given by the gravity models. Combination of these geophysical methods depicted the geometry of the aquifer. This example shows that in a similar geological setting proper integration of geophysical exploration methods can determine the aquifer geometry with an acceptable reliability and at an appropriate cost.

Key words: aquifer geometry, electrical resistivity, seismic reflection, gravity, Quetta Valley.