BoS4

SAGEEP4 Integrating Hydrology and Geophysics to Evaluate the Impact of Artificial Recharge on Groundwater in Rural India

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SUMMARY

The monsoonal climate of India coupled with the complex geology and low storage capacity of the Deccan basalts contribute to water scarcity in central India during the dry season. One of the primary tools proposed to manage this problem is the artificial recharge of runoff captured during the monsoon to enhance groundwater availability throughout the year. One common approach for artificial recharge is the construction of small dams to generate percolation ponds, as exemplified by a small reservoir in the Salri watershed of Mahdya Pradesh, India. We use this specific example to illustrate how the integration of geophysical and hydrologic data can be used to understand the influence of the dam on groundwater in the watershed. Electrical resistivity and electromagnetic induction surveys are used to assist in developing a geologic conceptual model for the watershed consisting of a thick sequence of basalt flows overlain in the lowland portion of the watershed by weathered basalt and alluvium for a depth of up to 10m. This geologic model has guided our understanding of the local flow system. A shallow flow system in the near-surface weathered basalts and alluvium is the primary source of water for agriculture. In contrast, vertical variability in the competent basalt flows is expected to create a highly anisotropic flow system with high horizontal permeability and low vertical permeability. As a result, the geophysical data help to form a conceptual model where the dam primarily impacts the shallow aquifer and has limited impact on deeper regional flow systems. To assess this hypothesis and quantify the impact of the dam on the overall hydrology of the watershed a hydrologic monitoring program was implemented. By integrating the geophysically-based conceptual model with this hydrologic data we are able to provide a quantitative assessment of the role of the dam within the watershed.

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