

Geophysical Methods of Mapping Groundwater Aquifer System: Perspectives and Inferences From Lisana Area, Western Margin of the Central Main Ethiopian Rift

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Abstract : In this study, two basic geophysical methods are applied for mapping the groundwater aquifer system in the Lisana area along the Guder River, northeast of Hosanna town, near the western margin of the Central Main Ethiopian Rift. The main target of the study is to map the potential aquifer zone and investigate the groundwater potential for current and future development of the resource in the Gode area. The geophysical methods employed in this study include, Vertical Electrical Sounding (VES) and magnetic survey techniques. Electrical sounding was used to examine and map the depth to the potential aquifer zone of the groundwater and its distribution over the area. On the other hand, a magnetic survey was used to delineate contact between lithologic units and geological structures. The 2D magnetic modeling and the geoelectric sections are used for the identification of weak zones, which control the groundwater flow and storage system. The geophysical survey comprises of twelve VES readings collected by using a Schlumberger array along six profile lines and more than four hundred (400) magnetic readings at about 10m station intervals along four profiles and 20m along three random profiles. The study result revealed that the potential aquifer in the area is obtained at a depth range from 45m to 92m. This is the response of the highly weathered/ fractured ignimbrite and pumice layer with sandy soil, which is the main water-bearing horizon. Overall, in the neighborhood of four VES points, VES- 2, VES- 3, VES-10, and VES-11, shows good water-bearing zones in the study area.

Keywords : vertical electrical sounding, magnetic survey, aquifer, groundwater potential

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