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Understanding Correlation between 1d Resistivity Distribution and Geochemistry of Subsurface Water Baring Layer

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Assessing groundwater quality using traditional tube well drilling is often expensive and time-consuming. To address this issue, the present study introduces a non-invasive, cost-effective method that uses electrical resistivity data to predict key water quality parameters eliminating the need for multiple drilling. The main goal was to explore correlations between resistivity measurements and geochemical indicators of water quality. To conduct this analysis, a specialized tool known as “Resist Software” was used to digitize both resistivity and geochemical datasets with the geochemical data obtained from the Water Resources Board, Anuradhapura. These datasets were then examined using scatter plots for natural, normalized, and logarithmic values. Among the three, logarithmic transformation of resistivity values revealed the strongest and most consistent correlations with vital water quality parameters (Adj. R squared = 0.289). In contrast, natural values showed weaker relationships. The findings highlight the importance of logarithmic analysis in bringing out significant trends that remain hidden in raw data. This approach not only deepens our understanding of subsurface water conditions but also provides a reliable tool for evaluating groundwater quality without multiple drillings. This correlation between resistivity and geochemical parameters improve the accuracy of groundwater assessments and hence this method supports better decision making in water resource management and minimizing the risk of investing in tube wells with poor water quality. Ultimately, this study contributes to the growing field of geophysics in hydrogeology and promotes economically viable water exploration practices.

Keywords: Conductivity, Correlation, Forward Modeling, Scatter plots, Vertical Electrical Sounding(VES)