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DEVELOPMENT OF A SEAWATER INTRUSION MODEL FOR THE KALPITIYA COASTAL AQUIFER IN SRI LANKA

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Abstract

Seawater intrusion is the influx of saline water into freshwater aquifers leading to groundwater quality degradation. The Kalpitiya Coastal Aquifer (KCA) of Sri Lankan is a limestone aquifer and its' adjacent groundwater is influenced by saline water. However, salt water intrusion modelling has not been deeply investigated in coastal regions in Sri Lankan context. Hence, this study aims to provide significant information to protect the KCA from contamination by seawater intrusion. A 3D variable-density groundwater flow model was used in this study to evaluate how far inland seawater has moved in the present and future situations. The model input parameters were chosen after reviewing geological records and permeability tests obtained from the National Water Resources Board, Sri Lanka. The numerical model for the pair density-dependent flow system was solved using the SEAWAT code. The estimated model was then run for the following 20 years (2016-2036) with the same hydrological parameters to assess the magnitude of seawater intrusion under four different scenarios (Scenario 1: no-change occur in the model; Scenario 2: pumping from the aquifer increase by doubling in the same pumping wells; Scenario 3: three new agricultural wells will be opened within the second scenario; Scenario 4: change in the annual precipitation rate occurs (20% reduction of annual precipitation). Scenario 3 demonstrated that water pumping from agricultural wells may lead to reduce or reverse groundwater gradient. Overall, the modelled results depicted that the aquifer beneath the KCA is susceptible to increased groundwater pumpage. Therefore, the aquifer should be continuously monitored to determine the progress of seawater intrusion and suggest the best solutions to prevent the intrusion. As new data becomes available, the model should be modified to reduce the uncertainty in the simulations.

Keywords: *groundwater modeling, Kalpitiya, seawater intrusion, SEAWAT*