NUMERICAL STRATEGIES TO CHECK THE OF SALT WATER INTRUSION IN CONFINED COASTAL AQUIFER

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Water is becoming a critical and scarce natural resource in most of the coastal regions with the growing requirement for diverse purposes. In recent times coastal regions witnessed increase in population and rapid growth in urbanization and industrialization. This has resulted in increased freshwater demand and to meet this demand new ground water based water supply schemes required to be planned. This has resulted in excess withdrawal of freshwater disturbing dynamic balance between freshwater and seawater in coastal regions and seawater intrudes in the aquifer. Though it is a slow process it leads to abandonment of coastal aquifers in some extreme cases.

An attempt has been made to give solution to this problem through numerical model, which involves strategy (location and rate) of freshwater pumping while combined system of treated water recharge and saltwater discharge wells are provided as control measure so that seawater wedge is unmoved. The numerical model developed is capable of predicting seawater intrusion in coastal aquifers over a wide range of field parameters. In this approach two non-linear partial differential equations of ground water flow and solute transport are coupled. These equations are expressed in terms of freshwater head and solute concentration where, both, are dependent variables. Solutions are obtained by numerical approach involving Galerkin's Finite Element Method. Results are compared with some of the existing solutions. The verified model is extended to examine the influence of various field parameters involving aquifer dispersivity and hydraulic conductivity on seawater intrusion in confined coastal aquifer.

Combined system of treated water recharge and saltwater discharge wells creates a barrier to control seawater intrusion and freshwater pumping wells are operated on landward side to explore freshwater which can be used for diverse purposes based on its ppm value. Suitable locations for battery of pumping wells are worked out for scientific withdrawal of freshwater from the coastal aquifers. Depth of wells and the well heads, which play important role from economy point of view, are also worked out. From the present study it is observed that location of pumping wells, its depth and well head play very important role in safe delivery of freshwater in coastal aquifers. The study finds safe region for pumping well location upto $x/L = 0.5$ (about middle of the toe and seacoast). The pumped water can be used for drinking, irrigation and industrial purpose based upon it's ppm values which are shown in dispersed interface zone.