

EFFECT OF A PHYSICAL BARRIER FOR CONTROLLING SEAWATER INTRUSION

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ABSTRACT

Seawater intrusion is a major factor affecting the exploitation and management of a coastal aquifer. Seawater intrusion is strongly related to the rate of water extraction from the aquifer. In many coastal aquifers, the current practice is one of over-pumping accompanied by seawater intrusion. The consequence is the salinization of significant portions of the aquifer, adjacent to the coast and the need to shut off pumping wells.

Since the early 50's, the construction of barriers for controlling seawater intrusion has been suggested. Examples include the West Coast Basin Barrier, in the Los Angeles area, which is a hydraulic barrier, i.e., the barrier is created by a build-up of groundwater head by the injection of fresh water. The problem with this kind of barrier is that it requires significant volumes of water, which are not always available. There are also problems related to the operation of injection wells. Physical boundaries have been considered, but the idea was not implemented, primarily as a consequence of economic considerations.

Lately, it has been suggested to create physical barriers, either by installing sheet-piles or slurry walls in the vicinity of the coast (as in Japan), or by creating zones of reduced hydraulic conductivity, as a result of induced precipitation of gypsum (as suggested in the CRYSTECHSALIN project, sponsored by the European Community). The impervious or semi-pervious walls may be continuous (parallel to the coast or intermittent) and may extend over only part of the aquifer's thickness.

Information on the effects of such walls is required as an input to the economic analysis of the efficiency of such walls.

In this work, we have analyzed various configurations and distributions of low permeability walls and their impact on the extent of seawater intrusion. A synthetic aquifer of regional size and properties was defined and a model for the simulation of density dependent flow and salt transport was applied.

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