

Utilization of local material in the construction of an embankment for recharging groundwater aquifer with treated wastewater effluents

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Water Science and Technology

Vol. 40, Issue.7, 1999

Abstract: Water is certainly the most precious and valuable resource of the physical environment for all living creatures. It is now well established that in many agricultural regions in the Kingdom of Saudi Arabia, the water table has been depleted dramatically. If the current level of agricultural production is to be maintained, other sources of agricultural water must be found. There is at least a billion cubic metres of secondary municipal effluent wasted annually. Thus, utilization of these wastewater effluents to recharge groundwater aquifers and reuse them at least for agricultural purposes becomes a viable proposition. In the study reported herein, treated wastewater will be used to recharge aquifers using spreading basins. The basin consists of a dune sand filter confined, from all sides, by an embankment of compacted sand/marl material. A field site has been constructed in Al-Aziziyah in eastern Saudi Arabia. The sand filter is constructed from clean dune sand, has an area of 25 x 25 m, and has an effective height of approximately 7.0 m. The stability and permeability of the embankment were of primary importance, and its construction had been precisely controlled. The materials used in the construction are locally available. The characteristics of the materials, the construction procedures, and the stability analysis are presented in detail. Water is certainly the most precious and valuable resource of the physical environment for all living creatures. It is now well established that in many agricultural regions in the Kingdom of Saudi Arabia, the water table has been depleted dramatically. If the current level of agricultural production is to be maintained, other sources of agricultural water must be found. There is at least a billion cubic metres of secondary municipal effluent wasted annually. Thus, utilization of these wastewater effluents to recharge groundwater aquifers and reuse them at least for agricultural purposes becomes a viable proposition. In the study reported herein, treated wastewater will be used to recharge aquifers using spreading basins. The basin consists of a dune sand filter confined, from all sides, by an embankment of compacted sand/marl material. A field site has been constructed in Al-Aziziyah in eastern Saudi Arabia. The sand filter is constructed from clean dune sand, has an area of 25 × 25 m, and has an effective height of approximately 7.0 m. The stability and permeability of the embankment were of primary importance, and its construction had been precisely controlled. The materials used in the construction are locally available. The characteristics of the materials, the construction procedures, and the stability analysis are presented in detail.