THE HYDROGEOLOGY OF THE ATHI BASIN

by

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ABSTRACT

The area in which the occurrence, quantity and quality of the ground water are investigated in this study, is the Athi Basin, in southern Kenya. The area of the basin is approximately 68,000 square kilometres. It is bounded by latitudes 0° 40' and 4° 45' south, and longitudes 36° 35' and 40° 10' east. The north western highlands are underlain by volcanic rocks, the central plateaus and lowlands are underlain by metamorphic rocks and the coastal lowlands are underlain by sedimentary rocks.

The climate is characterized by rainfall whose contribution to the ground-water recharge is greatly suppressed by relatively high evapotranspiration. The ground-water recharge is more significant along fault zones and within outcrops of loose sediments, and more so where the suppressive effect of evapotranspiration is relatively low, for example, in the north western highlands. The ground-water discharge which significantly contributes to the perennial stream flows is associated with the contacts between the metamorphic rocks and the overlying volcanic rocks.

Three main types of aquifers have been identified, namely, the weathered overburden, fault zones and the loose sediments. The first two aquifers are commonly associated with the metamorphic rocks and the consolidated Permo-Triassic sandstones and the last aquifer is associated with the volcanic rocks and Cenozoic sedimentary rocks. The highest borehole yields

are associated with the loose sediments, and the lowest, with the weathered overburden aquifers.

Chemically four types of water are common in the basin. These are classified on the basis of the dominance of cations and anions i.e. calcium-magnesium-bicarbonate, calcium-magnesium-chloride, sodium-bicarbonate and sodium-chloride. The calcium-magnesium-bicarbonate water is found in Quaternary volcanic rocks and Kilindini Sands. It has the lowest values of total dissolved solids as well as salinity and sodium hazards. It is therefore useful for most purposes.

The calcium-magnesium-chloride water has the highest values of total dissolved solids, with most of the ions being above the recommended concentration limits. The salinity and sodium hazards for the water are relatively high. Consequently this water has very limited practical use. The fluoride concentrations are commonly within the recommended limits except in some isolated pockets in the north western region, and as such, fluoride is not a main threat to the ground-water use in the basin.

The highest ground-water development is concentrated in the north western highlands and the lowest, in the central plateaus and lowlands. The critical problem facing current development is the limited knowledge of the capacities of individual aquifers within a given rock type. This makes proper conservation impossible. Future groundwater development in the basin requires proper planning particularly in the north

western highlands and the coastal plain which may face possible problems of aquifer depletion or sea water intrusion, respectively. Planning should be preceded by proper pump tests which can quantify the capacities of individual aquifers, and monitoring of long term fluctuations of physical and chemical characteristics of the ground water.