

ABSTRACT

Hydrogeological Study of the Lower Yallahs Basin,

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This thesis deals with the hydrology, hydrogeology and groundwater resources of the Lower Yallahs Basin, Jamaica, and the alluvial aquifer of the Yallahs Basin. Geological aspects of the basin which play an important part in understanding the hydrogeological relationships are also reviewed. Surface electrical resistivity methods (vertical electric soundings) and seismic profiling were applied to aid in defining the geometry and properties of the aquifer.

The areal extent of the Basin is 13.5 km² and that of the alluvial aquifer is 10.9 km². The Basin can be subdivided into four hydrostratigraphic units on the basis of transmissivity and storativity of the alluvial layers within. The aquifer exists only in one of these hydrostratigraphic units, that is in the one nearest to the sea. The alluvial aquifer consists primarily of coarse sandy gravel with boulders, and its base is formed by low permeability clay, clayey marl and marly limestone units of Miocene to Pliocene age which occurs at 20.6 - 140.6 m below ground level. Surface flow in the basin is intermittent, and channelized subsurface flow occurs below the river bed in the northern part of the basin which became the main recharge factor to the alluvial aquifer in the southern part of the basin. Aquifer transmissivity calculated from pumping tests averaged 4,844 m²/day. The vertical electrical sounding (VES) curves provided an average of 0.2 for the storage coefficient (s). This is in good correlation with the data range of $0.1 < s < 0.3$ based on the nature of the aquifer and values reported for similar material from the literature. The sustained flow of the aquifer was calculated to be 45,170 m³/day, while the minimum flow needed to keep the sea water interface from moving inland was 12,880 m³/day based on an estimated value of the aquifer

thickness of 1,316 m. The amount of water available for development was calculated to be 11,095 m³/day, or 7,688 m³/day in excess of present demands. The well-field configuration designed for optimum exploitation of the available resources allows a maximum withdrawal at any location of 5,010 m³/day and the radius of influence obtained for this was 572 m, for a storage coefficient of 0.1. Water quality throughout the aquifer was generally good and the water is of bicarbonate type.

DEDICATION

I dedicate this work to my late father, Dr George Kovács.