

pumping rates and economic parameters relating to agricultural production. We have used both types of computer. The analogue computer studies were carried out at the Computation Laboratory of the United States Geological Survey at Phoenix, Arizona, under the direction of Mr. Herbert E. Skibitzke, and the digital computer studies were made on an I. B. M 7090 Computer by the Harvard Water Resources Group under the direction of Professor Harold A. Thomas, Jr., in Cambridge, Massachusetts.

Analogue Computer Studies of Effects of Pumping in Project Areas

The analogy between the flow of a viscous fluid through porous media and the flow of electricity through a conductive network is well established in the literature.(14) (15) The fundamental equation describing one flow system is equally applicable to the other. The aquifer is simulated in the analogue model by a rectangular grid network of resistors and capacitors, in which each resistor is inversely proportional to the coefficient of transmissibility and each capacitor directly proportional to the coefficient of storage. The choice of scale factors is governed by the size of the aquifer to be modeled, the time span under consideration, and the performance characteristics of the electronic equipment used. We shall summarize the results of two investigations on the analogue computer that yield practical conclusions relating to the optimal size of project area.

Analysis of a Modeled Ten-Mile Strip of Aquifer

An analogue computer study was made of a ten-mile strip one mile in width with canals along each end, as shown in Figure 7.8. The region is pumped by 10 tubewells located along the longitudinal axis. The purpose of the study was to ascertain the rate of lowering of the water table in the central portion of the area with various pumping rates and patterns of recharge.

Questions have been raised as to the effectiveness of pumping in lowering water tables near canals, streams or water courses. Experience with the Rasul Project, undertaken in 1945, which involved about 1800 tubewells in Rechna and Chaj Doab, indicated the difficulties in reducing ground water elevations near canals with inadequate intensity and capacity of pumping.

(14)H. E. Skibitzke, "Report on Hydrology on Indus Plain, West Paksitan."

(15)W. J. Carplus and W. W. Soroka, Analogue Methods, Chapter 10, 2nd Edition, McGraw-Hill, 1959.