

Experiment No. 10

“To study the effect of rainfall on a circular island with a central well”

Apparatus Name: Advanced Hydrological Apparatus



HYDROGEOLOGY LAB

CENTRE OF EXCELLENCE IN WATER RESOURCES ENGINEERING

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Procedure:

The circular ended ring should be placed on the sand concentric with the central well. The ring should then be pushed into the sand until only half remains visible, and the inside volume should now be filled to the rim with sand excavated to form a ditch just outside the ring (see Figure 5).

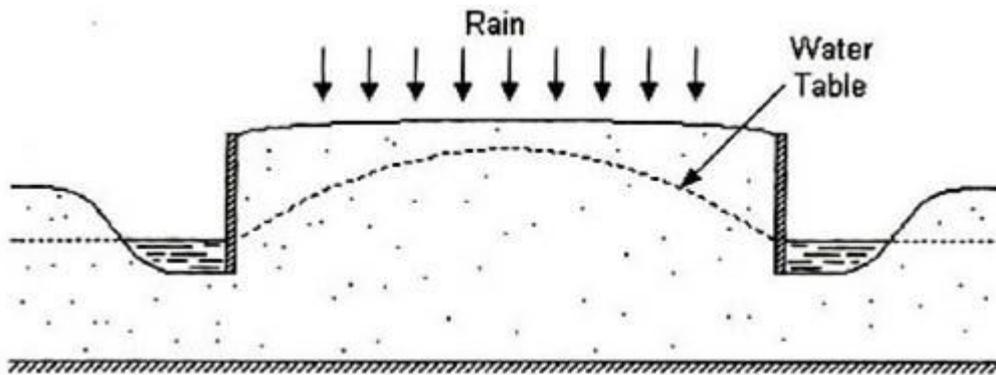


Figure 5

This ditch must connect with a second straight one linking it to the end outlet, which will ensure a drainage route for water entering the ditch and so help to keep a constant water level in it.

The spray nozzles are now turned on and, when the water table is steady, the manometers can be read to enable a profile of the water table to be plotted. It is important when plotting this profile to relate it accurately to the position of the ring and other ground features. The water filled ditch surrounding the island serves to isolate its ground water conditions from effects outside.

In the second part of this experiment, the spray nozzles are stopped, and water is withdrawn from the central well drain control valve.

A compensating flow must be introduced with the ground water supplies (inlet control valves) to produce a steady water table elevation. This well discharge ought to be less than the rate of rain recharge falling on the central island in the first part of the experiment, and the correct value can be selected only by trial- and-error.

When the water table profile has been determined and plotted, the sprays should be turned on again to their previous setting and the combined effect of surface recharge and central well abstraction determined. The water table under these combined effects should reach a maximum height at some radius less than that of the "island". This maximum marks the water divide for ground water flow, rain falling inside this radius flowing to the well and outside to the "sea". When an island is set in a salt sea it is obviously very important that this water divide exists or saltwater will be drawn through the soil to feed the well.

If the principle of superposition applies, the combined water table profile can be predicted by 'adding' the water tables determined previously under each separate ground water flow.

Observations and Calculations:

Tapping Position m	Manometer Reading (Rainfall Only) m	Manometer Reading (Groundwater Only) m	Manometer Reading (Rainfall Only + Groundwater Only) m	Manometer Reading (Rainfall and Groundwater) m

Rainfall Flow Rate: _____ l/min
Ground Water Inflow Rate: _____ l/min

Assignment:

- a) Did the results suggest that the method of superposition is applicable to this simulation?
- b) What can be learned from the model that can be usefully applied to real world situations?