CE-UY 3243 Water Resources Engineering
Homework 5

Distributed: Oct. 3, 2020 revised Oct 8, 2020
Due: Oct. 9

Problem 1

Consider a 15-ft thick horizontal confined aquifer. The bottom of the aquifer is located 70 ft below the ground surface. ~~A well is installed and is~~ Three wells are installed and screened in this aquifer. Before any pumping begins, the water level in each well is located 10 ft below the horizontal ground surface. One of the wells is then pumped at a rate of 180 gal/min until steady state drawdown occurs. After steady state has occurred, the hydraulic head is 54.34 ft above the bottom of the aquifer in the observation (non-pumping) well located 27 ft from the pumping well and the hydraulic head is 57.56 ft above the bottom of the aquifer in the observation well located 79 ft from the pumping well.

(a) Calculate the ~~hydraulic head (h) and~~ drawdown at each of the two observation wells. (report ~~four~~ two answers)

(b) Make a sketch that completely defines the problem. The sketch should be neat and should fit the full width of a sheet of paper. It should be scaled appropriately; the horizontal and vertical scales can differ. Label the ground surface, the aquifer top and bottom, all three wells with well screens, dimension lines that indicate the dimensions from the problem statement, and the ~~four~~ two values calculated in part (a).

(c) Estimate the hydraulic conductivity. Report your answer in gpd/ft^2 and ft/s. Is this value of hydraulic conductivity "high" or "low"? What types of unconsolidated sediments have this value of hydraulic conductivity? What types of consolidated deposits?

Problem 2

The bottom of an unconfined aquifer is a horizontal layer of rock that is located 50 m below the ground surface. The water table is initially located 20.4 m below the ground surface. A 30 cm diameter well is driven to the bottom of the aquifer and pumped at 6500 L/min until steady state conditions are achieved. At this time the drawdown at a distance of approximately 1100 m from the well is zero (this is termed the radius of influence of the well). The drawdown at the well is 9.14 m.

(a). Make a sketch that defines the problem. Label all known dimensions.

(b) Calculate the original thickness of the aquifer, the drawdown at the well after steady state is achieved, and the thickness of the aquifer at the well after steady state is achieved.

(c) Estimate the hydraulic conductivity.

(d) The pumping rate is reduced to 1500 L/min. Estimate the new steady state drawdown at the well. Assume that the radius of influence does not change.