Due: 1/22/09

Physical Hydrogeology

Problem Set 1

1. At a water elevation of 6390 ft, Mono Lake has a volume of 2,900,000 ac-ft, and a surface area of 48,000 ac. Annual inputs to the lake include 8 in. of direct precipitation, runoff from gauged streams of 150,000 ac-ft per year, and ungauged runoff and groundwater inflow of 36,000 ac-ft per year. Evaporation is 45 in. per year.

   a) Make a water budget showing inputs, in ac-ft per year and outputs in ac-ft per year. Does the input balance the output?

   b) Will the average lake level rise or fall from the 6390 ft elevation over the long term?

   c) What would be the lake surface area when the inputs balance the outputs? (Assume that the volume of gauged and ungauged runoff and groundwater inflows remain constant with a change in lake surface area.)

   d) What is the residence time (average time that it would take for the volume of water to be exchanged once) for water in Mono Lake when the water surface is 6390 ft?

2) The flow of a river at the start of a baseflow recession was 715 m^3/s; after 60 days the flow declined to 520 m^3/s.

   a) What is the recession constant?

   b) What would be the flow after 115 days?

3) A drainage basin has an area of 120 km^2. How long will overland flow continue after the flood peak passes?

4) Figure 2.28 in Fetter is the hydrograph of a river with a long summer baseflow recession. Compute the volume of annual recharge that occurs between runoff year 1 and runoff year 2.

5. An object has a mass of 850 Kg and a volume of 0.65 m^3.

   a) What is its density?

   b) What is its specific weight?

   c) Is it more or less dense than water?