CWR 5125 – GROUNDWATER HYDROLOGY
HOMEWORK No. 6 – Fall 2021
Instructor: Professor Fuentes

Required homework is graded over 100 and all problems have same value. ***This homework may be solved and submitted either individually or in teams of up to students.***

Reading Assignment: Part V (Chapters 6, 7 and especially 8)

Required Problems:
(Due Date: Friday, November 25, 2021, by 8:00 pm or preferably any day earlier)

Problem A. An accidental spill from a point source introduced 10 kg of contaminant mass to an aquifer. The seepage velocity in the aquifer is 0.1 ft/day in the x-direction. The longitudinal dispersion coefficient D_L = 0.01 ft^2/day, the lateral and vertical dispersion coefficient, $D_y = D_z$ = 0.001 ft^2/day.

a) Calculate maximum concentration at x = 100 ft and t = 5 years. What would you answer be if the D_L could be 25% higher?

b) Calculate the concentration at point x = 200 ft, y = 5 ft, z = 2 ft, 5 years after the spill. If the water quality standard is 0.001 mg/L, would you conclude that the site is contaminated?

c) Based on the above information, make a sketch of the plume.

Problem B. Domenico & Schwartz (1998) developed a model for a planar source that accounts for the source geometry with longitudinal, lateral, and vertical spreading. The steady state model was applied at the plan of symmetry where y = z = 0 (see Figure 6.8).

The model is to be applied to the case of continuous source that has been leaking contaminant into an aquifer for 15 years. The source had a width Y and a depth Z of 6 m, the initial concentration of the source was 10 mg/L, the seepage velocity is 0.057 m/day, and the longitudinal, transverse, and vertical dispersivities were estimated at 1 m, 0.1 m, 0.01 m respectively.

a) *Calculate the present contaminant concentration at x = 200 m from the source, using the Domenico Model.*

Recommended Problems:
(Any practice problem from Chapters 6, 7 and 8, which can be solved by analytical solutions)