Use Visual Modflow to finish this homework! **After finishing the project, I will like to have EACH of you to demonstrate your model to all of us on May 2nd in Room 308!**

1. A manufacturing facility that manufactures printed circuit boards puts wash water that was used to wash solvents from the circuit boards into an underground tank that discharges into groundwater. The wash water contains 5 mg/L or 5000 μg / l of dissolved trichloroethylene (TCE). The underlying aquifer has an average linear groundwater velocity of 0.2 m/day. The underground tank can be simplified as a patch source in a three-dimensional aquifer. The horizontal length of the tank is 10 meters long. The upper boundary is 1 meters below the water table, and the lower boundary is 5 meters below the water table. The thick gray clay is found to be 15 meters below the water table (i.e., the aquifer is 15 meters thick). The longitudinal dispersivity can be assumed to be 5 meters, the horizontal transverse dispersivity is 0.5 meters, and the vertical transverse dispersivity is 0.05 meters.

(a) If the tank is regarded as a constant-concentration boundary, and assume the TCE is non-reactive, what are the concentration distributions at times of 100 days, 200 days, and 500 days at the elevation where the center of mass is located? What are the concentrations at a monitoring well located x=22 m, y=2 m, and 3 meters below water table down gradient of the underground tank discharge at the times of 100 days, 200 days, and 500 days?.

(b) If the tank is regarded as a constant-concentration boundary, and assume the TCE is reactive with a retardation factor of R=1.2, what are the concentration distributions at times of 100 days, 200 days, and 500 days at the elevation where the center of mass is located? What are the concentrations at a monitoring well located x=22 m, y=2 m, and 3 meters below water table down gradient of the underground tank discharge at the times of 100 days, 200 days, and 500 days?

(c) If the underground tank is removed and source area is cleaned after leaking about 210 days and assuming the TCE is non-reactive, what are the concentration distributions at times of 100 days, 200 days, and 500 days **after removing the source** at the elevation where the center of mass is located? What are the concentrations at a monitoring well located x=22 m, y=2 m, and 3 meters below water table down gradient of the underground tank discharge at times of 100 days, 200 days, and 500 days **after removing the source** at the elevation where the center of mass is located?

(d) If the underground tank is removed and source area is cleaned after leaking about 210 days and assuming the TCE is reactive with a retardation factor of R=1.2, what are the concentration distributions at times of 100 days, 200 days, and 500 days **after removing the source** at the elevation where the center of mass is located? What are the concentrations at a monitoring well located x=22 m, y=2 m, and 3 meters below water table down gradient of the underground tank discharge at times of 100 days, 200 days, and 500 days **after removing the source** at the elevation where the center of mass is located?

Hint:

a. The elevation of the center of the mass is where the center of the source is located.

Due: March 7, 5:00PM (Friday), 2008

b. I did not tell you the dimension of the x and y axis, so you need to choose a sufficiently large x and y dimensions to make sure those boundaries will not affect the transport simulation.

c. I did not tell you what Kx, Ky, and Kz to use, so you need to select the those values (such as typical sandy aquifers) and the appropriate hydraulic gradient and effective porosity to make sure the groundwater velocity is 0.2 m/day.

d. I did not tell you how much layers to use, but will suggest you use larger or equal to 5 layers to be able to see the vertical details of concentration. However, making too many layers may make your model slow.

e. I think you can print some of your outputs in room 308. If not, make sure to save everything in a disk for demonstration!

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