***Course: GW Flow and Contaminant Transport Modeling***

**Assignment #6: Simulation of contaminant transport**

The task to be solved is based on the geometry of Assignment#4 (*15 boreholes drilled on an area of 400 x 300 m, fine sand layer and an underlying gravelly sand layer with ground level and the thicknesses of the given worksheet. The horizontal hydraulic gradient is 0,002 m/m in any direction upon your wish, GW level is approx. 2.5 m below the surface in the middle of the model, all not mentioned data can be freely chosen by the student but should be coherent to the soil type*).

Additionally please apply 50 mm/yr recharge from precipitation for the whole model domain. There is a tank leakage of 0.15 $m^3/d$ in the sandy layer from the beginning, and 250 mm/yr recharge under a non-isolated industrial waste disposal site of an area of 30 · 40 m size from the beginning of the $5^{th}$ year. All the four wells (defined in the assignment#4) are active with the following average production rates (W1: 50, W2: 120, W3: 75, W4: 50 $m^3/d$).

There are two investigated contaminants: Benzene and Toluene. The transport properties of the two components are as follows: $K_d$ = 1.2 $m^3/g$ and 1.5 $cm^3/g$, Half-life: 1000 d and 1500 d, long. dispersivity in sand 3m, in gravelly sand 2m, transversal dispersivities: 0,3 and 0,2m respectively. Molecular diffusion coefficient $5 \cdot 10^{-11}$ $m^2/s$ for both components.

**<u>Tasks:</u>**

1. modify the GW flow model of Assignemnet#4 by adding recharges, new wells, etc. as required and prepare it to be able to simulate transport procedures
2. build a transport model of the site for 15x2 years period with the given contamination sources (exact location is freely chosen) The concentration of tank leakage liquid is 45 000 μg/L (benzene) and 35 000 μg/L (toluene), the areal industrial pollution strength is 1 770 000 μg/L (benzene) and 530 000 μg/L (toluene) which is equal to water solubility of the mentioned components
3. install monitoring wells in the model domain into both layers to a location effected by the contamination
4. determine the concentration distribution and make concentration animation for both layers
5. determine concentration-time curves for the pumping test period in representative locations of the model
6. establish a slurry wall of U or L shape to slow down the contaminant migration on reasonable sites regarding the freely chosen location of wells and contaminant sources
7. determine the concentration distribution and to make concentration animation for both layers in this new situation
8. determine concentration-time curves for the pumping test period in representative locations of the model in this new situation

**<u>Deliverables:</u>**

In printed form a short report of the problem with

- the details of the chosen data
- graphic presentation of concentration fields, concentration vs time curves (each monitoring well, comparative graphs of wells screened to the same layer)
- the description and evaluation of results

Digitally (only at the end of semester)

- report in document form
- full dataset of the model
- plots in graphical form

**Borehole data:**

| X | y | z | Thickness1 | Thickness2 |
|---|---|---|---|---|
| [m] | [m] | [m asl.] | [m] | [m] |
| -6,4 | 309,5 | 98,7 | 18,1 | 16,7 |
| 412,5 | 310,2 | 98,6 | 17,5 | 13,5 |
| 406,4 | 107,8 | 99,9 | 17,2 | 12,7 |
| 411,8 | -6,2 | 99,3 | 19,1 | 17,1 |
| -29,2 | -25,6 | 98,9 | 19,7 | 16,6 |
| 103,5 | 190,2 | 98,8 | 22,4 | 18,6 |
| 209,4 | 235,1 | 100,4 | 21,3 | 16,4 |
| 322,0 | 114,5 | 98,2 | 21,5 | 16,2 |
| 182,6 | 103,1 | 100,9 | 23,0 | 17,3 |
| 48,5 | 251,9 | 98,6 | 20,4 | 17,1 |
| 345,4 | 268,6 | 98,3 | 20,8 | 16,0 |
| 360,2 | 50,1 | 100,3 | 21,0 | 18,0 |
| 130,3 | 30,7 | 99,4 | 20,6 | 16,5 |
| 52,6 | 76,3 | 99,2 | 19,9 | 17,1 |
| 200,7 | 157,4 | 100,5 | 24,7 | 19,5 |