

## ***GW Flow and Contaminant Transport Modeling***

### **Homework #1: Determination of breakthrough time of a well doublet (injection and production wells) vs. well distance**

#### ***Hydrogeological conditions:***

There is a shallow sandy gravel, gravelly sand aquifer suitable to establish fully penetrating wells. The shallow aquifer is phreatic (unconfined) with negligible horizontal groundwater flow. The hydraulic parameters of the aquifer can be freely chosen but the different parameters (horizontal and vertical hydraulic conductivity, effective porosity) should be coherent to each other. The thickness of the aquifer is also up to the student but at least 2/3 of the aquifer must be saturated, so the groundwater level is to be determined to keep this condition.

#### ***Hydraulic problem:***

There are two wells (one production and one injection) installed to support an open water to water heat-pump system. To make the proper operation of the system possible a given break-through time is to be assured, therefore it is to be calculated. Please determine the function describes the trend of breakthrough time vs. injection to production wells' distance. Install wells into different distances and determine the breakthrough time. Based on the data calculated at 5-6 different well distances the function is to be plotted.

#### ***Materials to be presented:***

In printed form a short report of the problem with

- the details of the chosen data
- graphic presentation of potential fields, pathlines
- breakthrough-time vs. well distance function
- 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