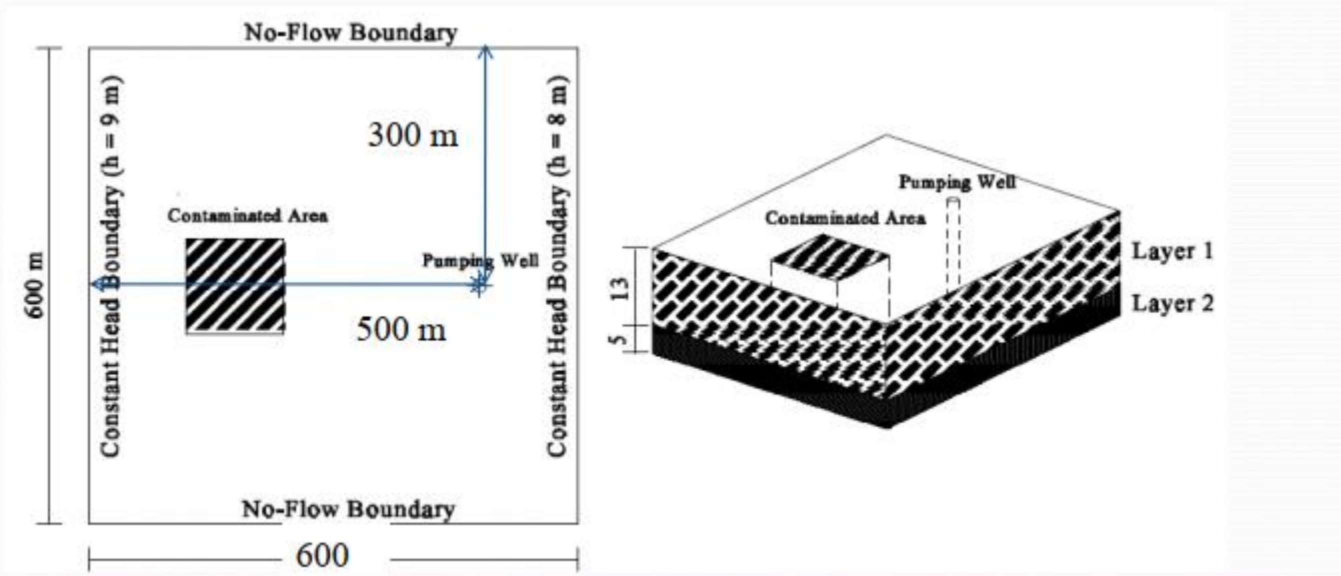
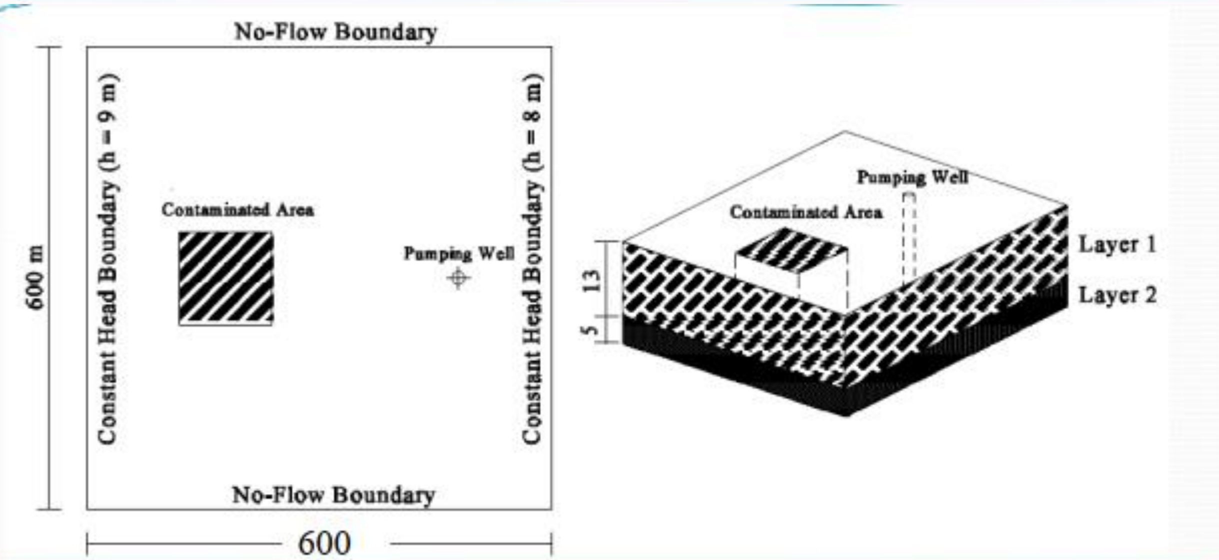


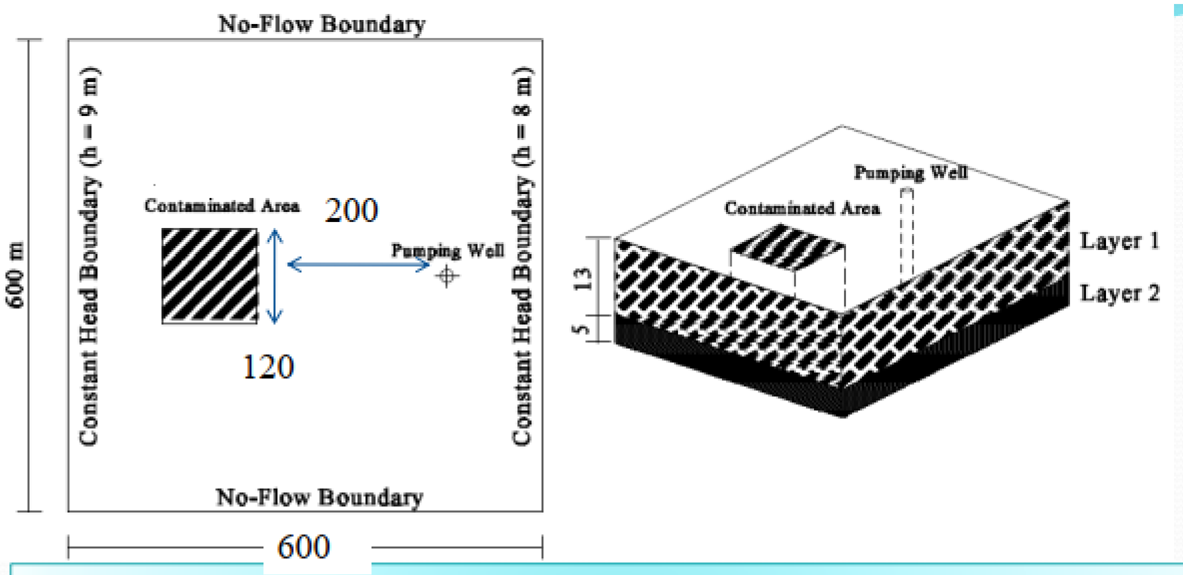
- ✓No- flow boundaries on the north and south sides
- ✓The west and east sides are constant-head boundaries
- ✓The hydraulic heads on the west and east boundaries are 9 m and 8 m
- ✓Initial hydraulic head= 8 m



✓The aquifer consists of two layers. The **first layer is unconfined** and the **second layer is confined**.

- ✓Horizontal **hydraulic conductivities** of the first and second layers are **0.005** m/s and **0.001** m/s
- ✓Vertical hydraulic conductivity of both layers **is about 10 percent** of the horizontal hydraulic conductivity.

✓The effective porosity is approximately 25 percent



✓The **elevation** of the top of the first layer is **10m**. The **thickness** of the first layer and the second layer is **13** m and **5**.

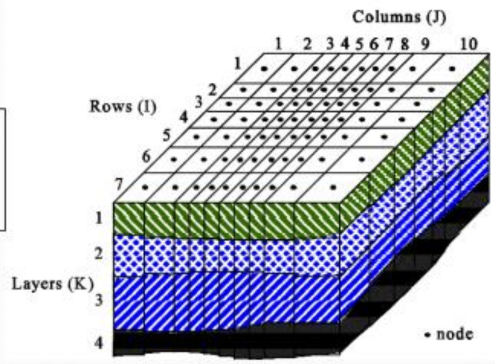
A contaminated area lies in the first layer next to the west boundary. To clean up the aquifer, a fully penetrating pumping well is located next to the east boundary.

A numerical model has to be developed for this site to calculate the required pumping rate of a well. The pumping rate must be large enough, so that the contaminated area lies within the capture zone of the pumping well

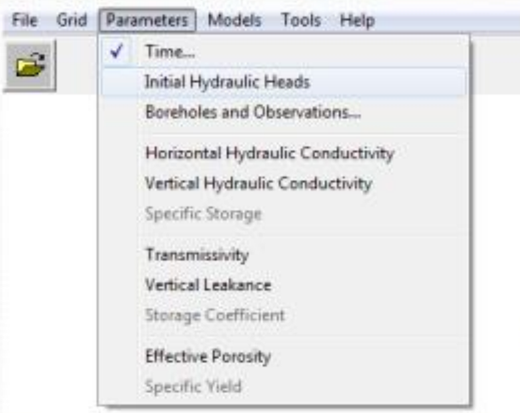
Assign model data

- An aquifer system is replaced by a discretized domain consisting of an array of nodes and associated finite difference blocks (cells).
- The locations of cells are described in terms of columns, rows, and layers.

✓The cell located in the 2nd column, 6th row, and the first layer is denoted by [2, 6, 1]



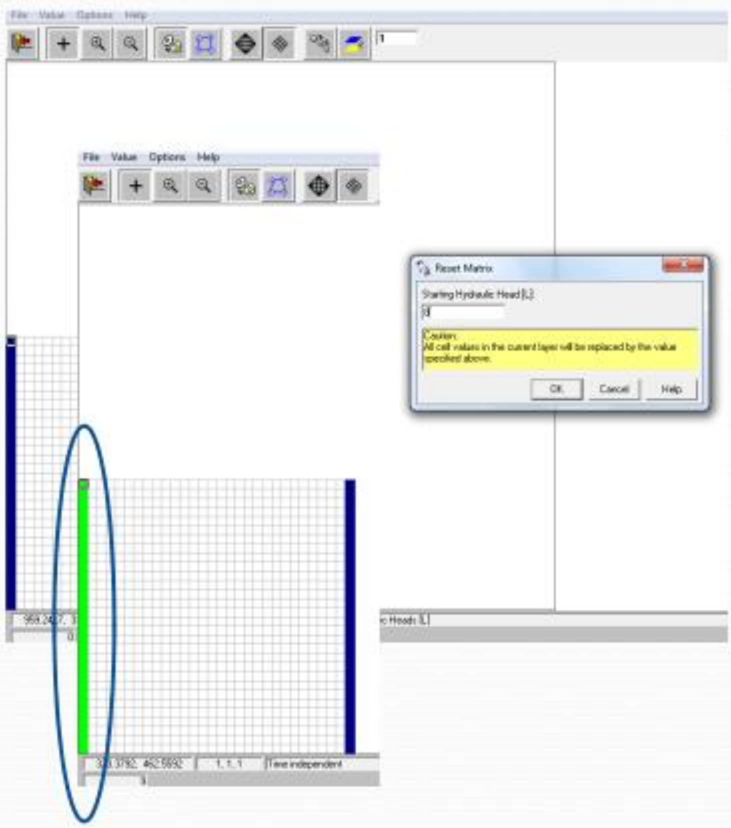
Specify the initial hydraulic head



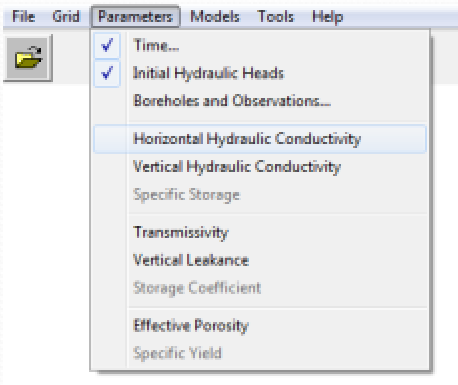
Initial head every where= 8 m

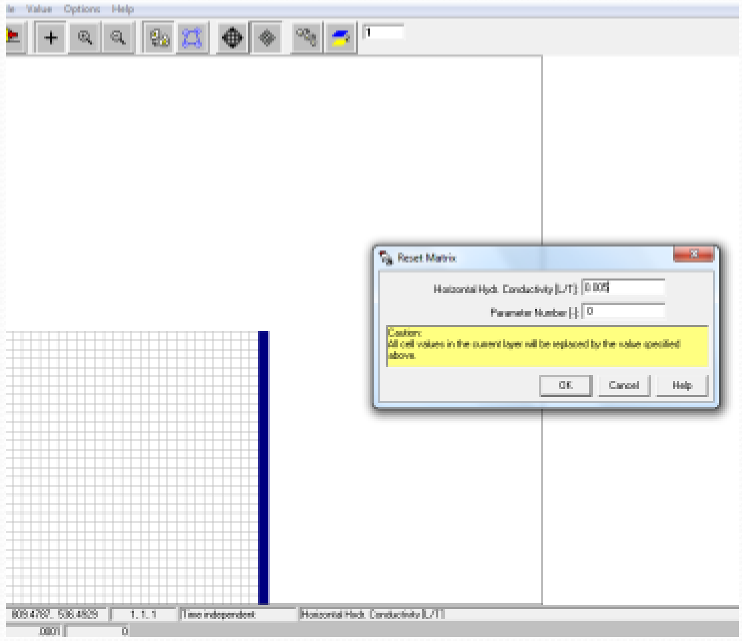
The left cells= 9 m (with Duplication icon)

Turn on layer Copy icon

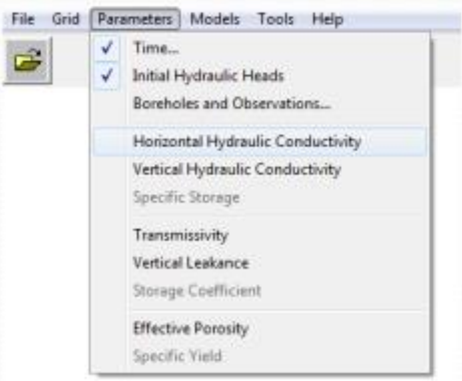


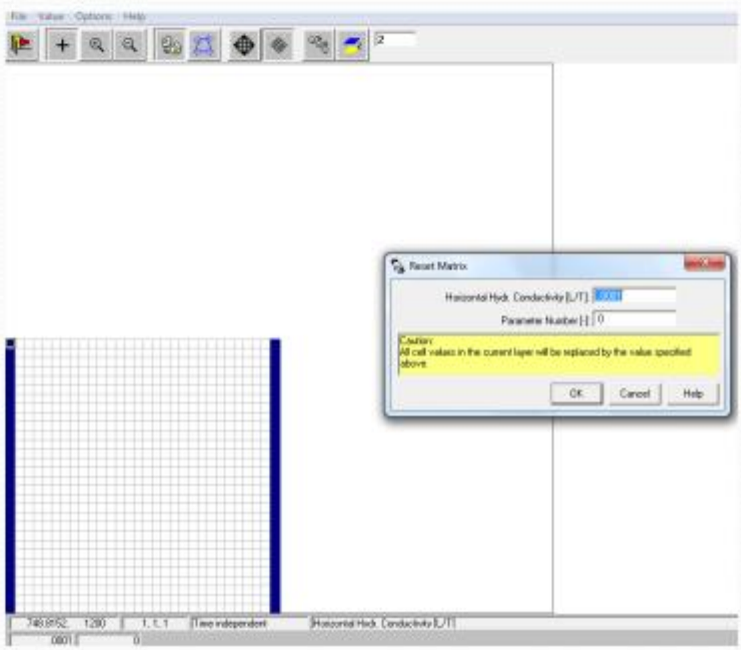
Specify the horizontal hydraulic conductivity





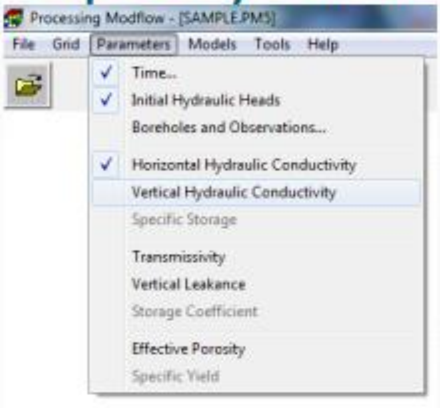
First Layer = 0.005

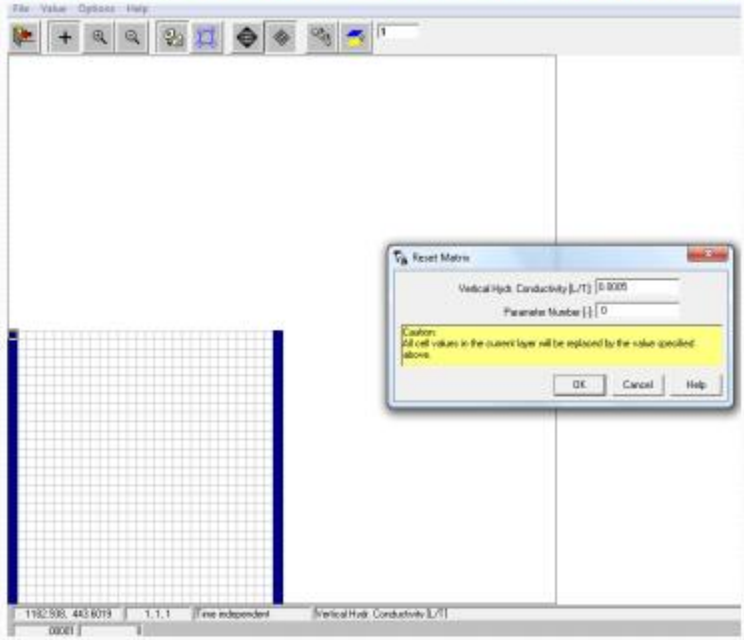




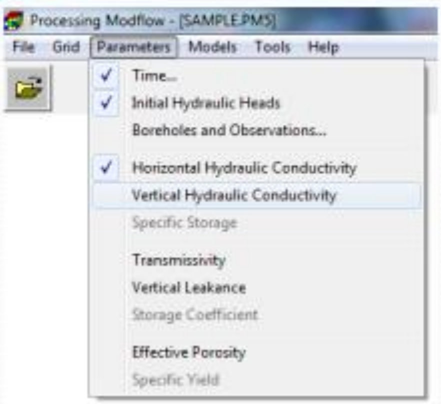
Second Layer = 0.001

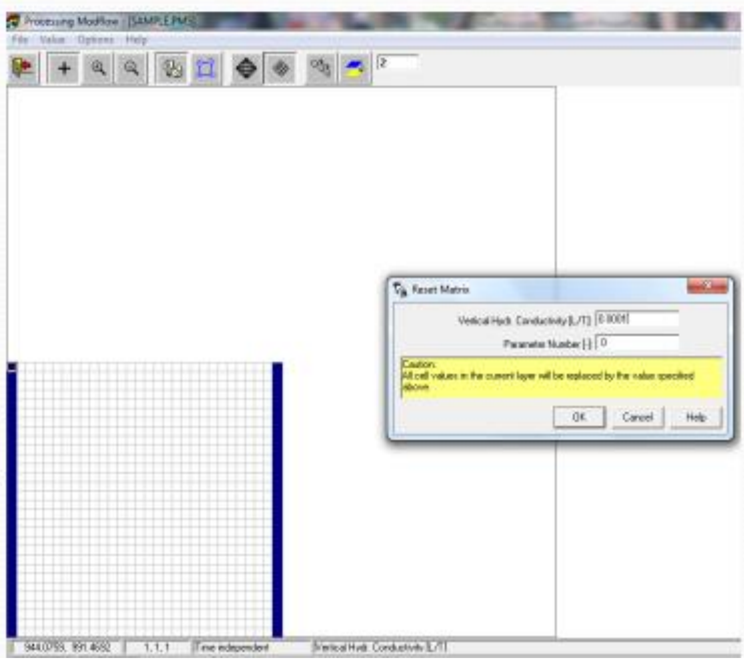
Specify the vertical hydraulic conductivity





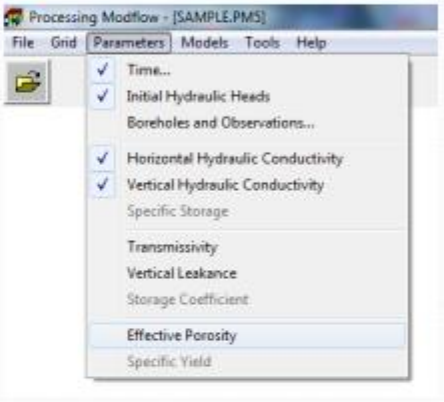
First Layer = 0.0005

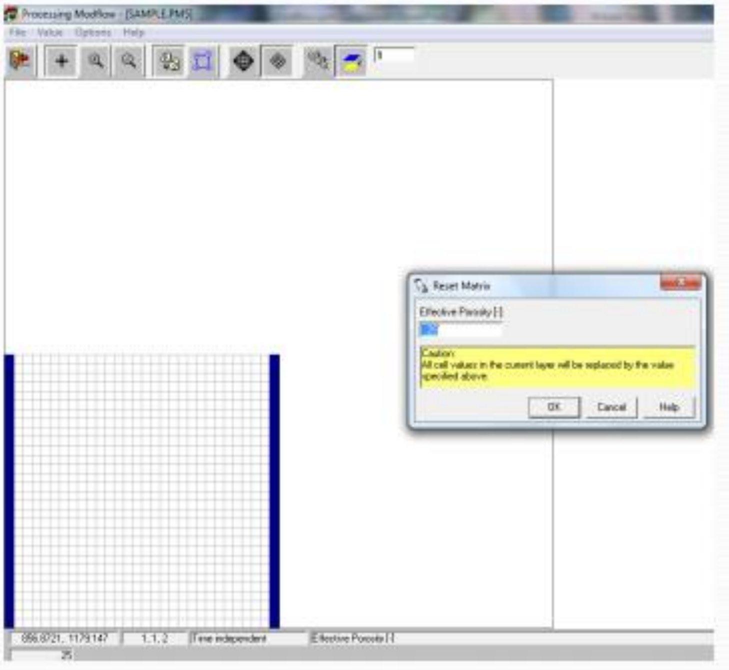




Second Layer = 0.0001

Specify the effective porosity





Both Layers = 0.25

- The final step before simulation is to specify the location of the pumping well and its pumping rate
- The total pumping rate for the multilayer well is equal to the sum of the pumping rates from the individual layers. The pumping rate for each layer (Qk) can be approximately calculated by dividing the total pumping rate (Qtotal) in proportion to the layer transmissivities

$$Q_k = Q_{total} \frac{T_k}{\Sigma T}$$

As we do not know the required pumping rate for capturing the contaminated area, we will try a total pumping rate of 0.02 m3/s. By above equation, the pumping rates are 0.0185 m3/s and 0.0015 m3/s in the first and second layer, respectively.