BELGIUM

Education evenings 2016

Practical introduction to groundwater modelling

Computer exercises
03 02 Particle tracking

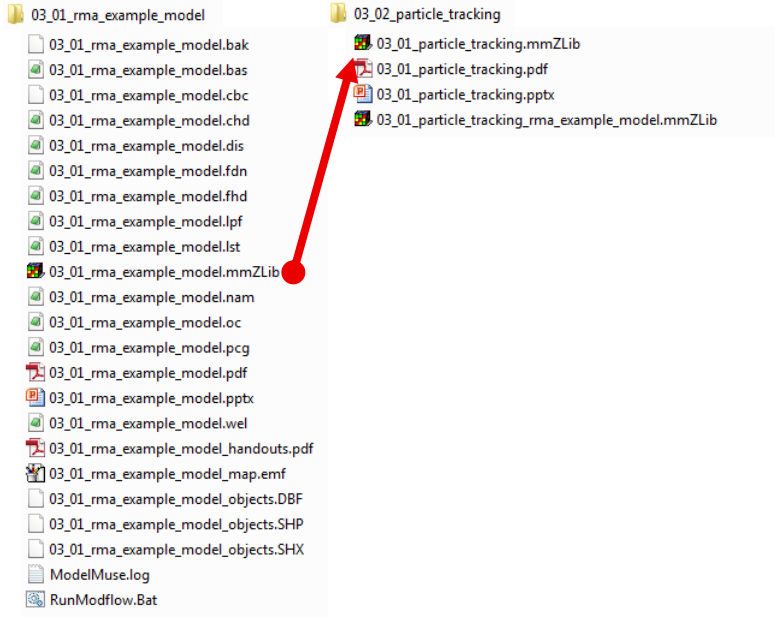
Purpose

In this example, we will use the Rocky Mountain Arsenal model, one of the examples that come with ModelMuse, to set up

- ✓ forward particle tracking to visualize advective flow paths from a disposal pond, and
- ✓ backward particle tracking to map an (advective) well capture zone.

Copy example model

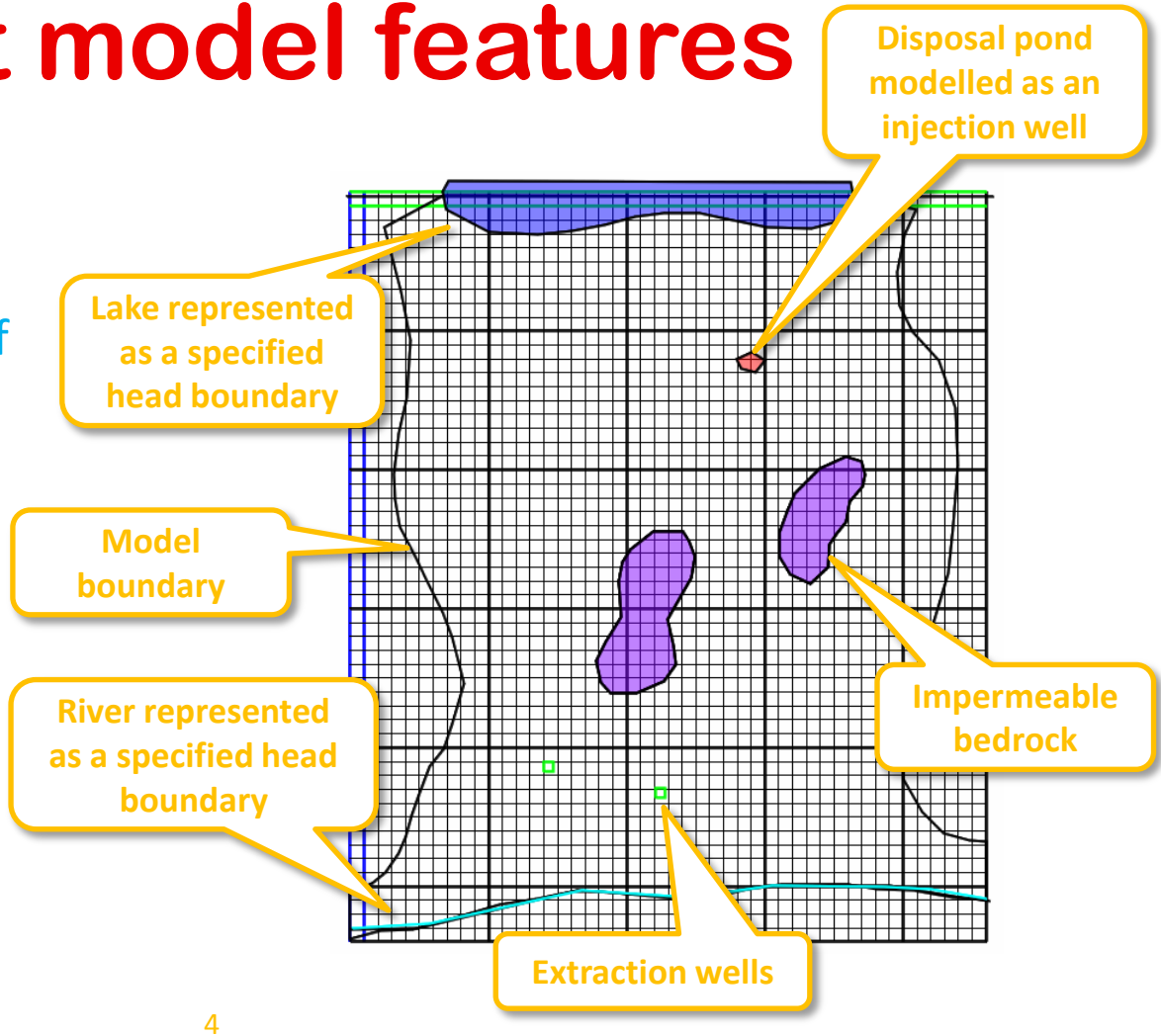
- ✓ Copy the model from the previous exercise “03_01_rma_example_model.mmZLib” to folder “/03_02_particle_tracking/”,
- ✓ and rename the copied file to “03_02_particle_tracking.mmZLib”.
- ✓ Another option is to copy file “03_01_rma_example_model.mmZLib” in folder “/06_solutions/”.
- ✓ Double click the new file to open ModelMuse.



Inspect model features

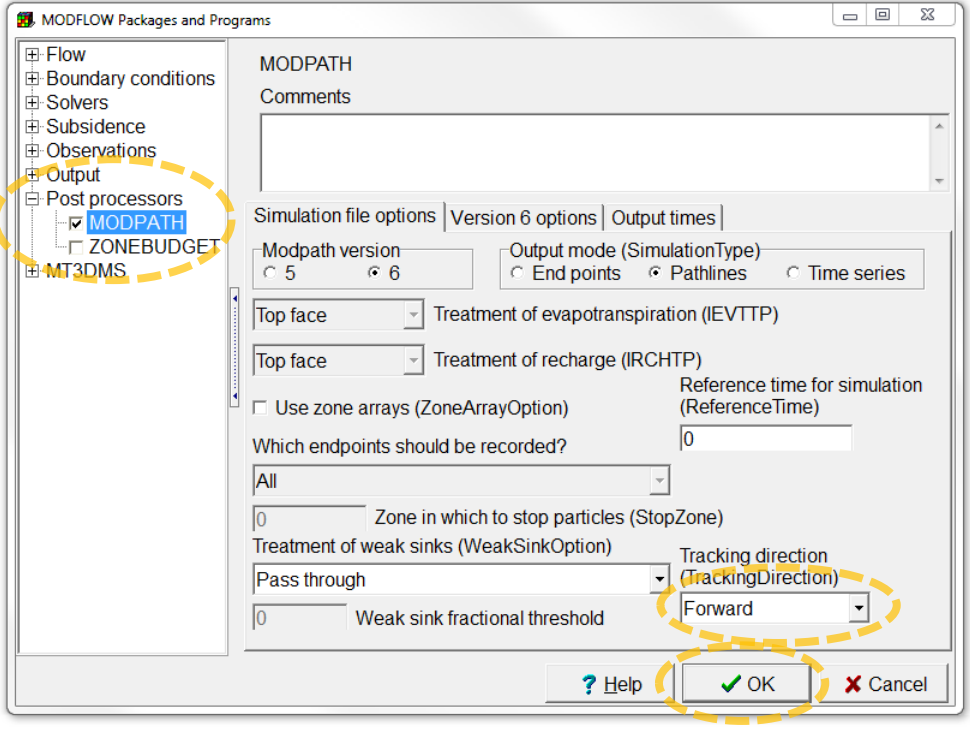
Take some time to inspect the objects and learn what model features they define, if you did not just create them yourself in the last exercise.

- ✓ What is the lake head?
- ✓ How is the river head specified?
- ✓ How is the impermeable bedrock simulated?
- ✓ How much does the extraction well pump?
- ✓ How much does the disposal pump leak?



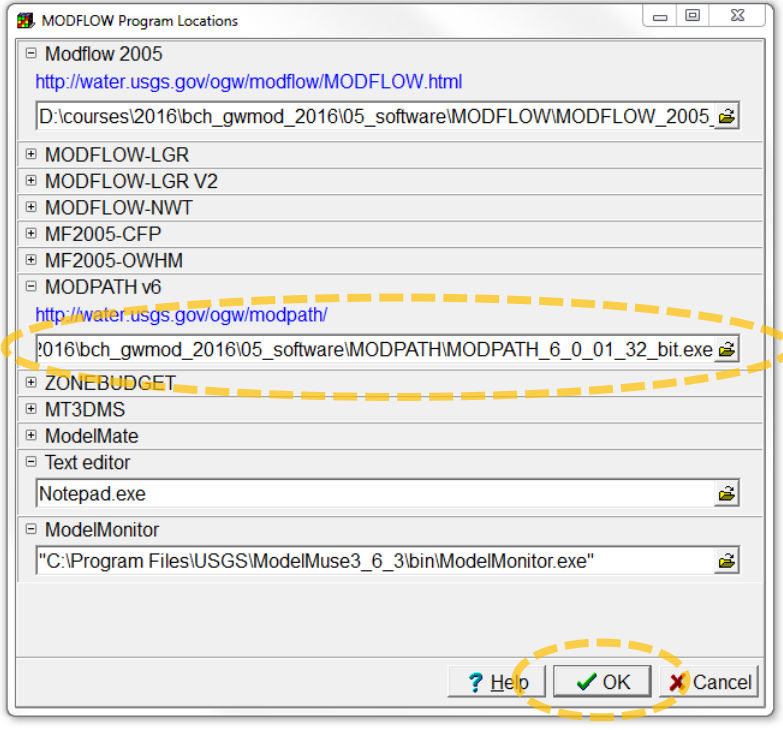
Enable MODPATH

- ✓ Select **Model|MODFLOW Packages and Programs…**,
- ✓ expand **Post processors**, and
- ✓ check the check box for **MODPATH**.
- ✓ Leave the default options as they are, but note we will be doing **Forward** tracking,
- ✓ and press **OK**.



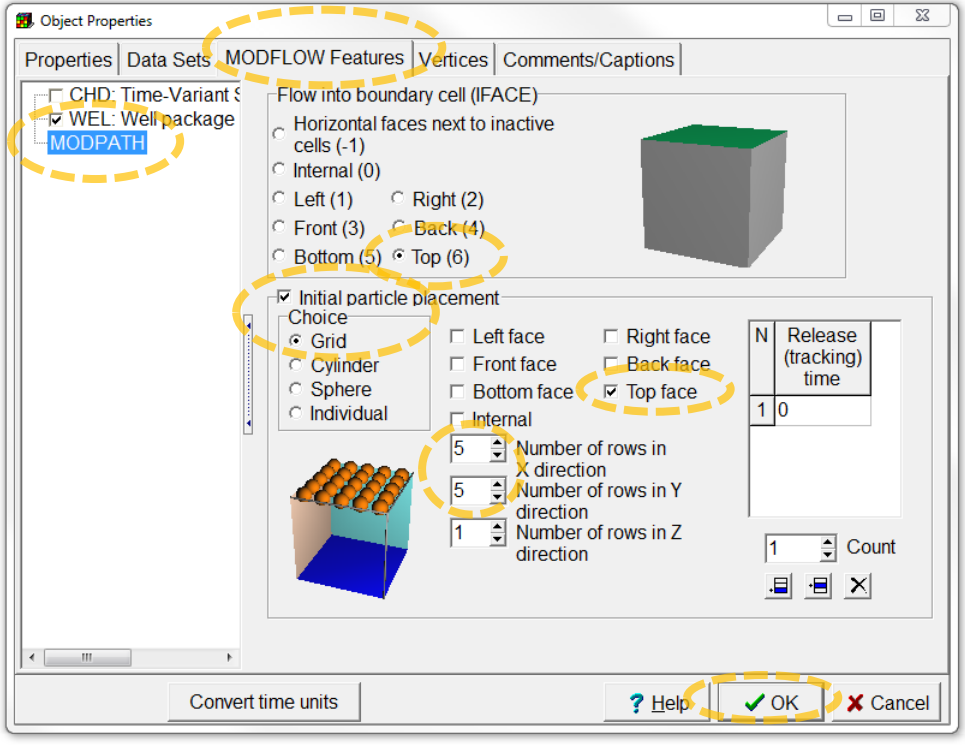
Set the MODPATH program location

- ✓ Select **Model|MODFLOW Program Locations**, and
- ✓ fill in the path to your preferred MODPATH executable in folder "/05_software/MODPATH/".
- ✓ Then press **OK**.



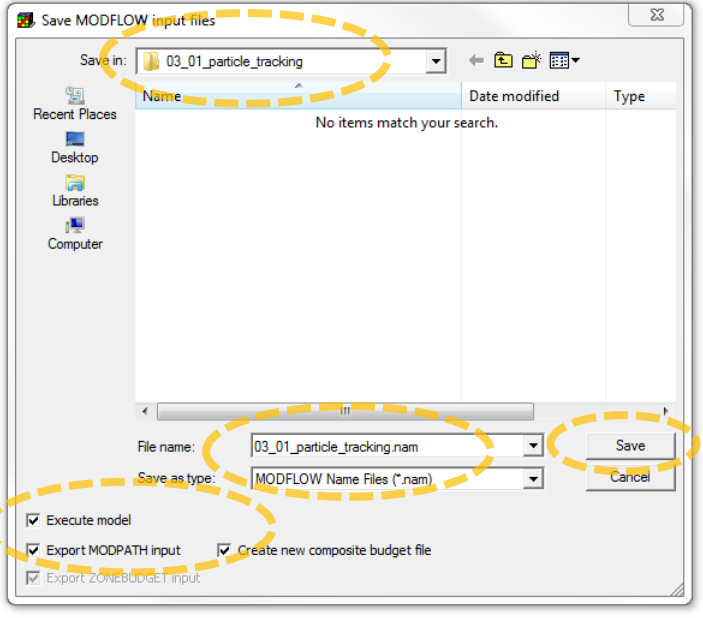
Define initial particle placement

- ✓ Double click on the disposal pond object,
- ✓ and in the **Object Properties** dialog box, select **MODFLOW Features**, and click on **MODPATH**.
- ✓ Set the flow into the cell at the **Top** face, and
- ✓ put 5 by 5 particles at the **Top face** in the **Grid**.
- ✓ Then press **OK**.



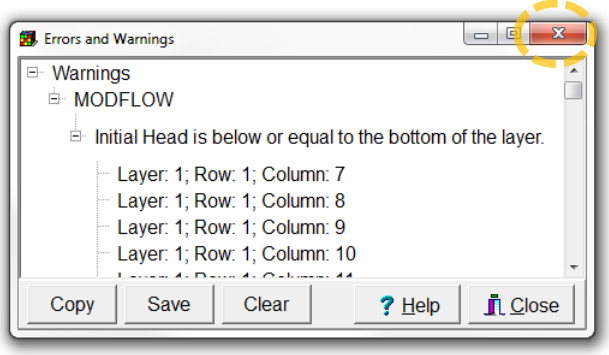
Run model (1/2)

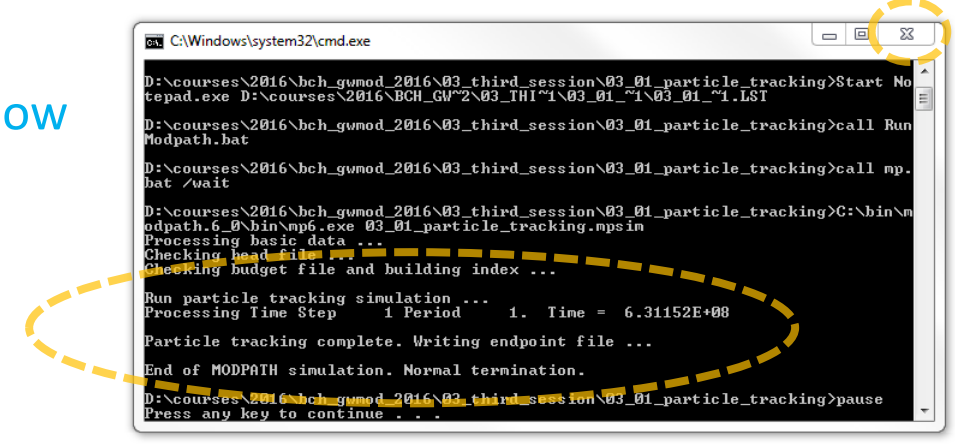
- ✓ Run MODFLOW by saving the MODFLOW input files.
- ✓ Note that the **Export MODPATH input** checkbox is selected as well, and
- ✓ check the **Create new composite budget file** checkbox.
- ✓ Press **Save** to save and run the model.



Run model (2/2)

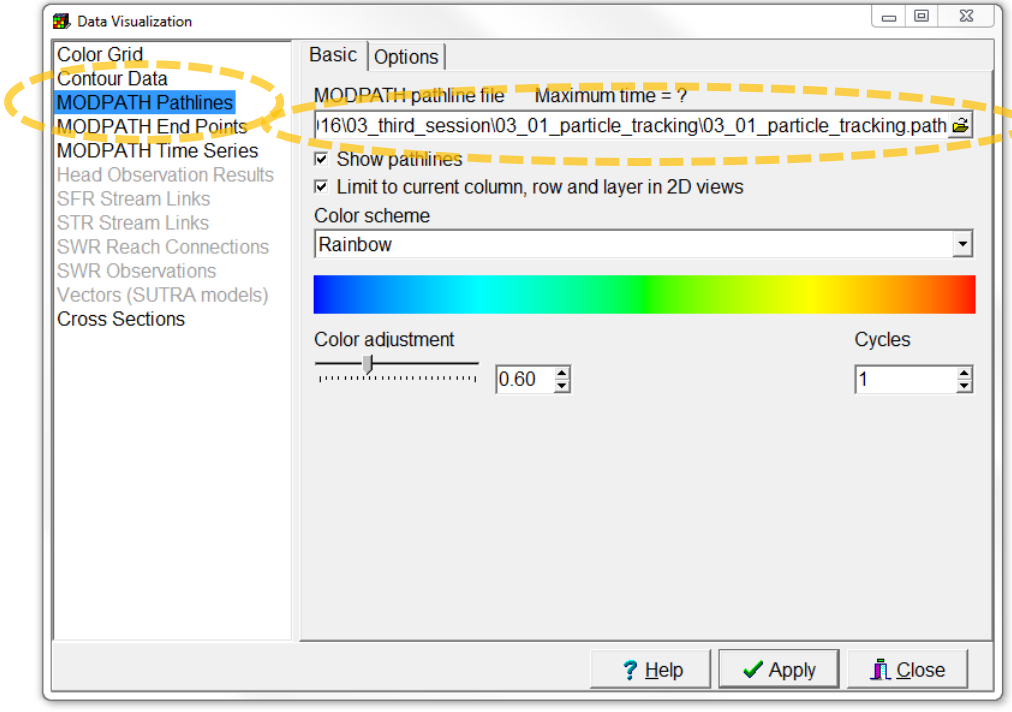
- ✓ You can neglect the warnings and close the **Errors and Warnings** window.
- ✓ Note that when you close ModelMonitor, MODPATH will be launched as well.
- ✓ Close the command line window after it has finished.





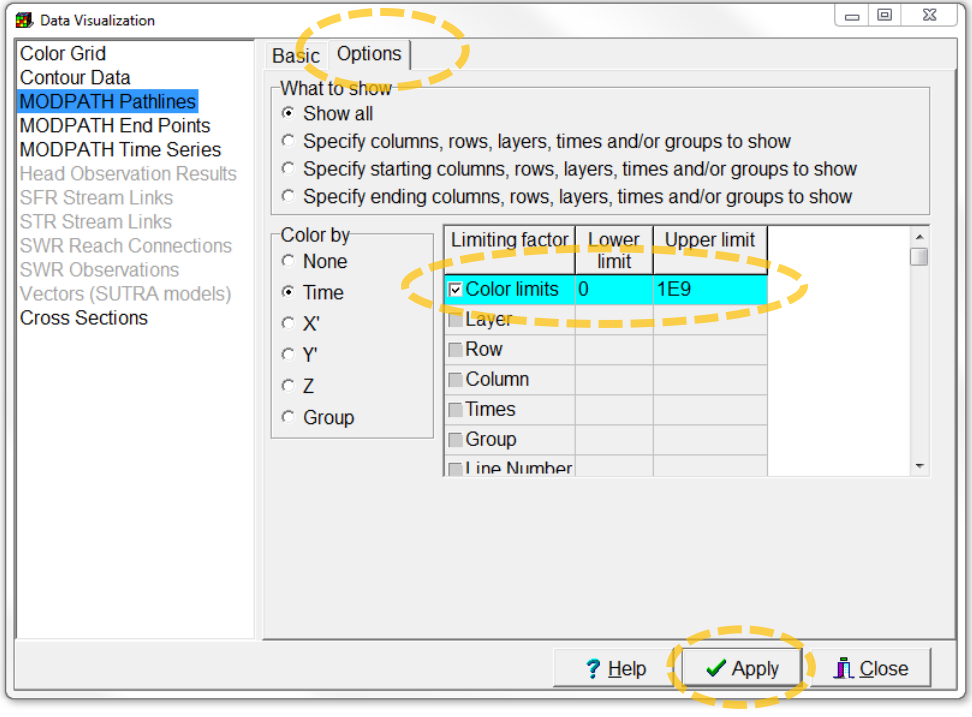
Visualize pathlines (1/2)

- ✓ Select **Data|Data Visualization…** or use the corresponding button,
- ✓ and choose **MODPATH Pathlines**.
- ✓ Select the MODPATH pathline file "03_01_particle_tracking.path".

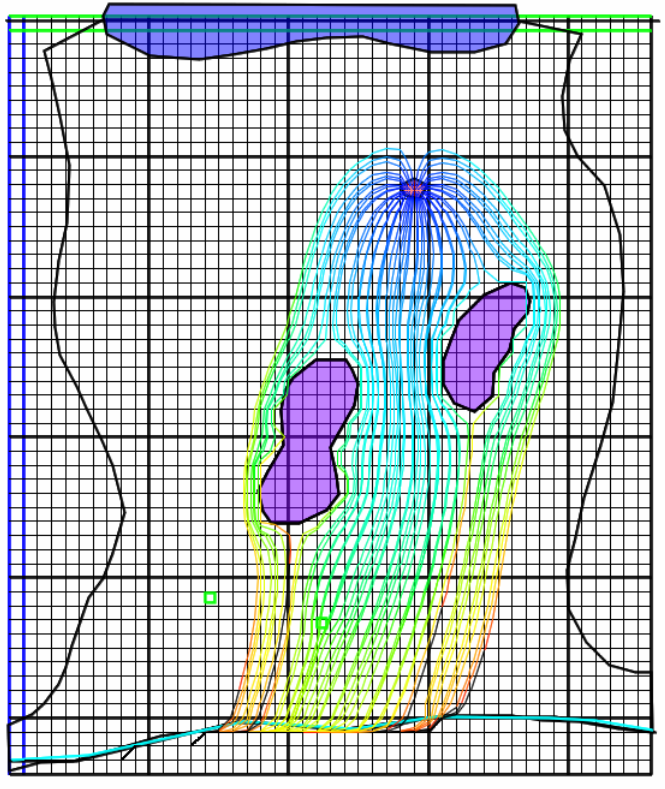


Visualize pathlines (2/2)

- ✓ Switch to the **Options** tab, and
- ✓ set the **Color limits** to 0 and 1E9.
- ✓ Then press **Apply**.

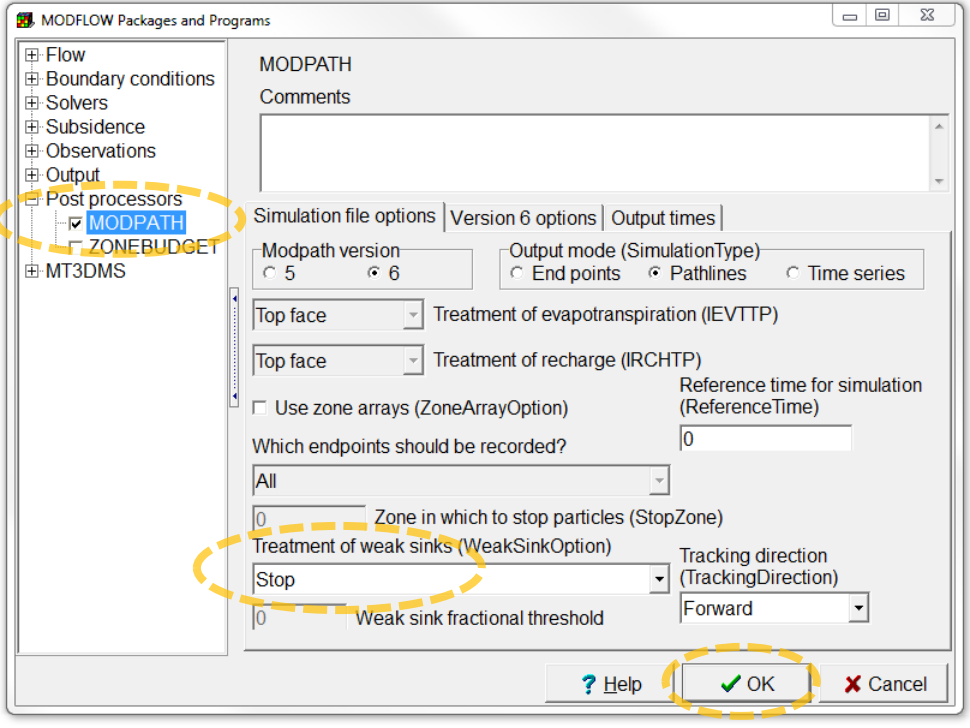


This is what you should get



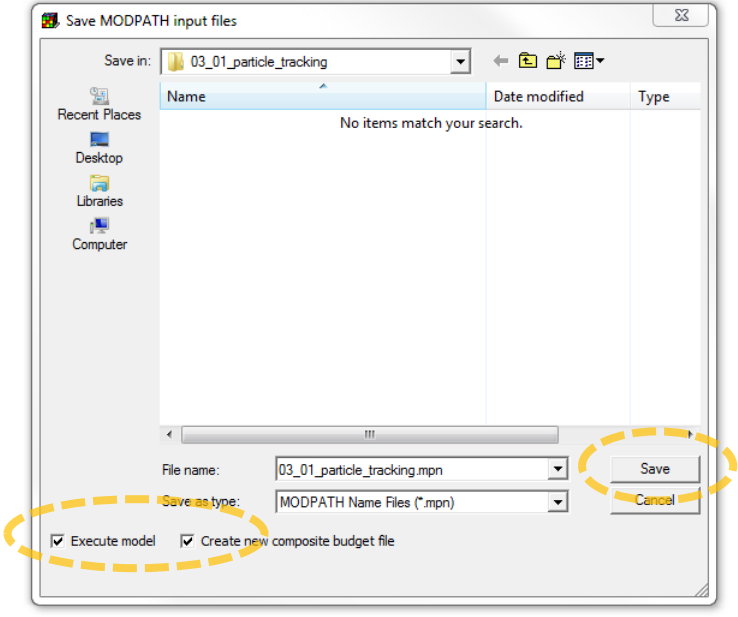
Rerun MODPATH without weak sinks (1/3)

- ✓ Select **Model|MODFLOW Packages and Programs…**,
- ✓ go to **MODPATH**,
- ✓ and set the **Treatment of weak sinks** to **Stop**.
- ✓ Then press **OK**.



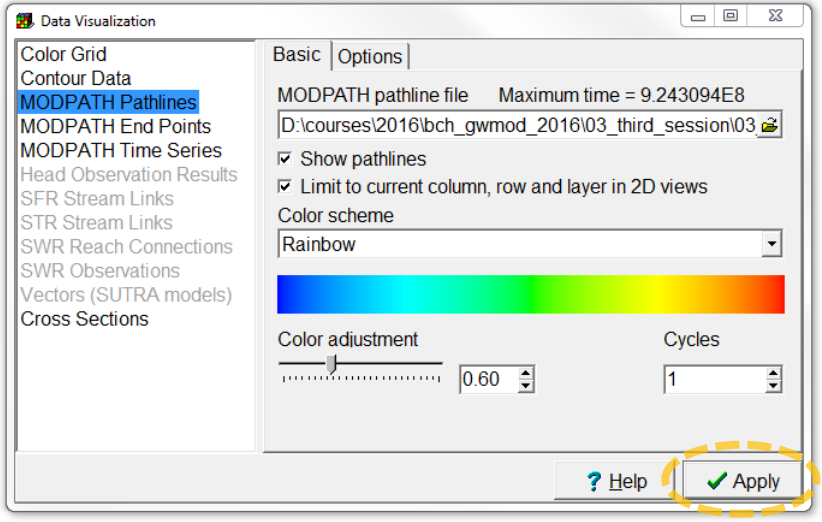
Rerun MODPATH without weak sinks (2/3)

- ✓ Select **File|Export|MODPATH Input Files**,
- ✓ check the **Execute model** and **Create new composite budget file** checkboxes, and
- ✓ press **Save**.



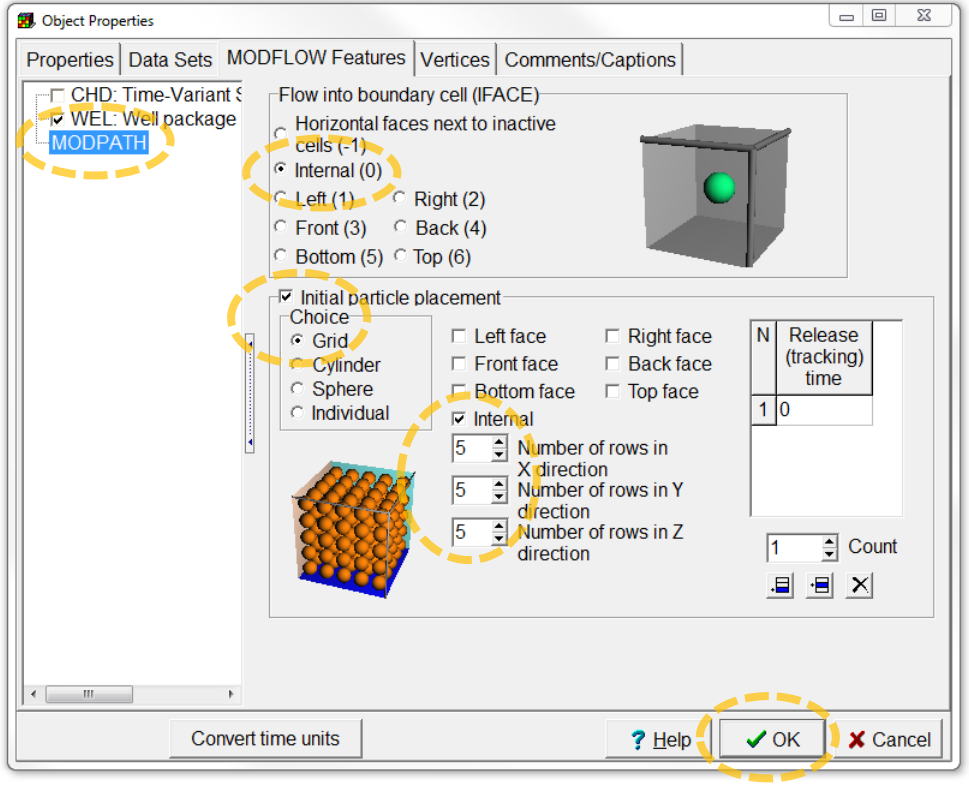
Rerun MODPATH without weak sinks (3/3)

- ✓ Now update the visualization in the **Data Visualization** dialog box, by pressing **Apply**,
- ✓ and click **Yes** to import the new file.
- ✓ Can you see what has changed by stopping the particles at weak sinks?



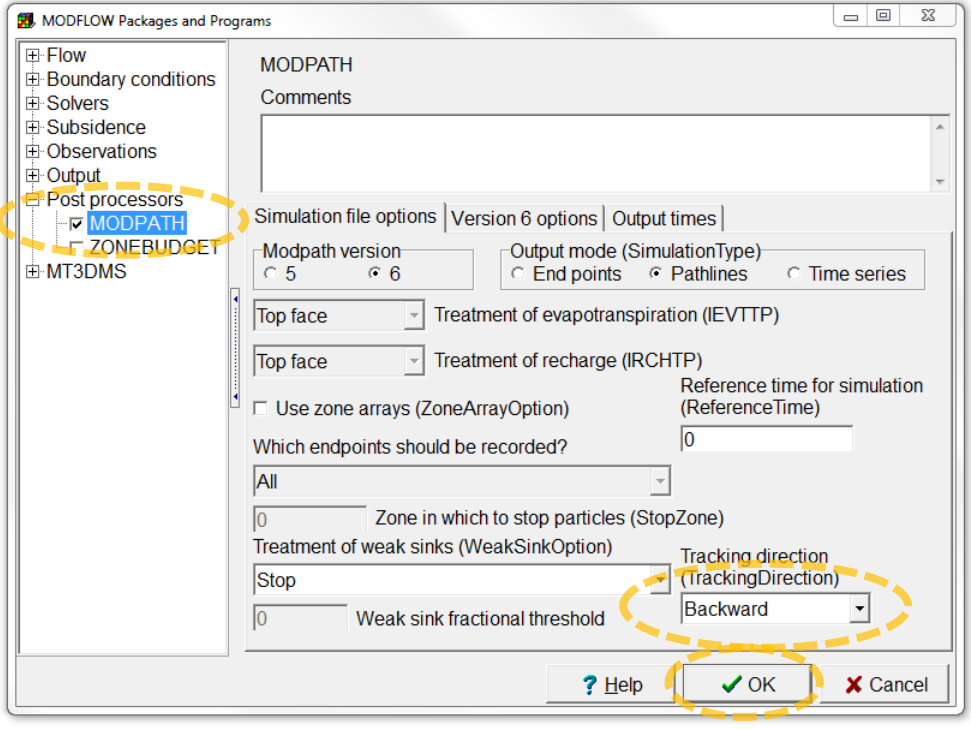
Define particles at well cells

- ✓ Double click on each of the extraction well objects,
- ✓ go to the **MODFLOW Features** tab in the **Object Properties** dialog box, and
- ✓ set **IFACE** to **Internal**,
- ✓ the **Initial particle placement** to **Grid** and **Internal**, and
- ✓ use 5 by 5 by 5 rows.
- ✓ Then press **OK**.



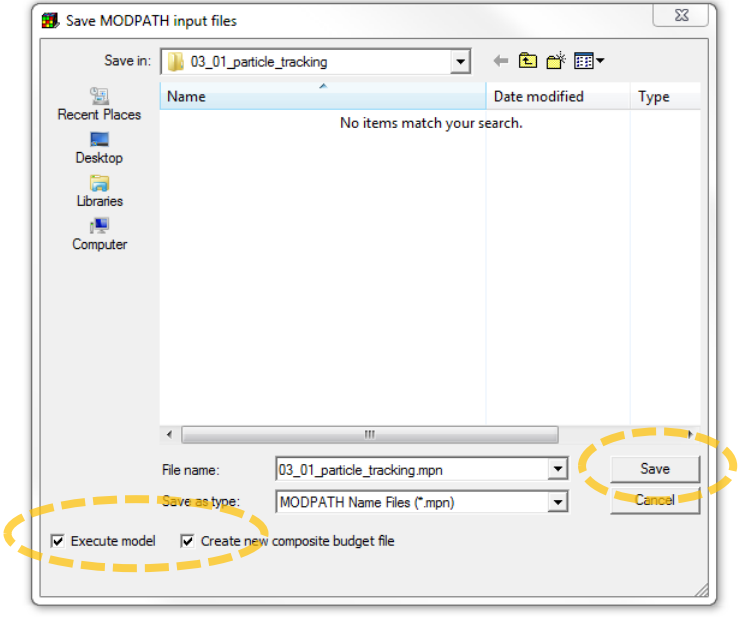
Rerun MODPATH with backward tracking (1/3)

- ✓ Select **Model|MODFLOW Packages and Programs…**,
- ✓ go to **MODPATH**,
- ✓ and set the **Tracking direction** to **Backward**.
- ✓ Then press **OK**.



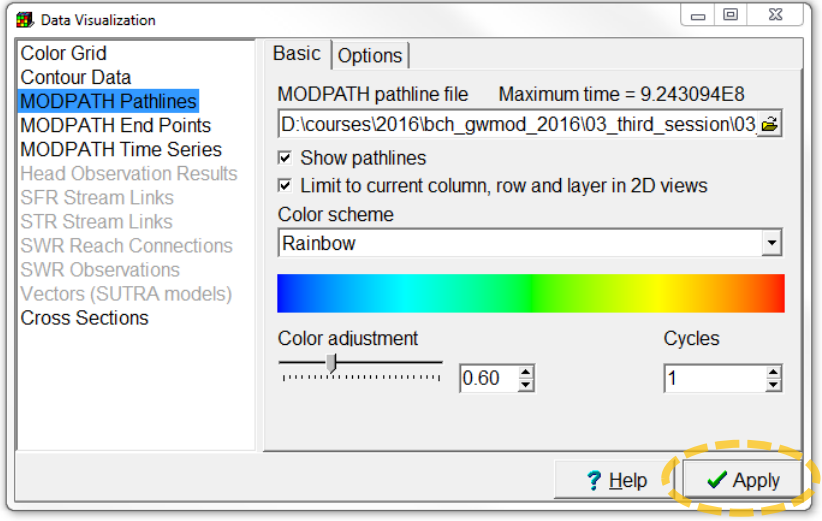
Rerun MODPATH with backward tracking (2/3)

- ✓ Select **File|Export|MODPATH Input Files**,
- ✓ check the **Execute model** and **Create new composite budget file** checkboxes, and
- ✓ press **Save**.



Rerun MODPATH with backward tracking (3/3)

- ✓ Now update the visualization in the **Data Visualization** dialog box, by pressing **Apply**,
- ✓ and click **Yes** to import the new file.



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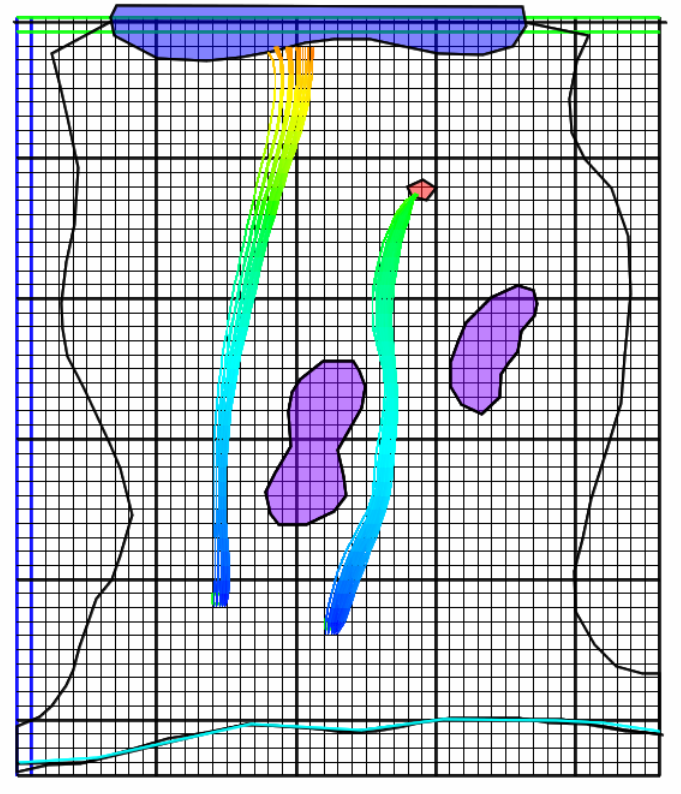

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Questions? Found an error?
Please contact B. Rogiers at brogiers@sckcen.be.