waterloo hydrogeologic
SOFTWARE • CONSULTING • TRAINING

WHI E-News
Waterloo Hydrogeologic Inc.

WHI E-News Topics

2003 February Edition

Product News

» **Visual MODFLOW 3.1 Released!**
» **Win a Dell Pocket PC! - Fill out the Visual MODFLOW Survey and enter to win!**
» **Visual Groundwater 3.0 Released!**

Consulting News

» **Groundwater Vulnerability Mapping in Karst Geology Environments**

Training News

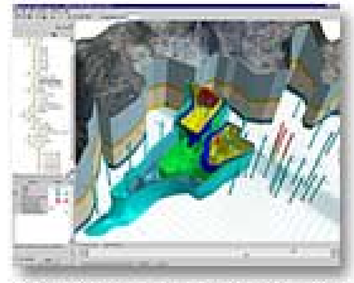
» **Course now available in Waterloo, Canada February 18-21**

Tips & Tricks

» **Modeling Outcropping or Pinching Layers in Visual MODFLOW**

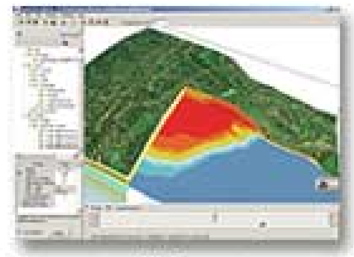
Product News

Visual MODFLOW Pro 3.1 Now Available!



3D Flow & Transport

Visual MODFLOW users have greatly anticipated the added functionality of this latest version. **Now, with the seamless integration of MODFLOW-SURFACT***,users have the added capabilities of simulating flow through the unsaturated zone! Plus, the **Visual MODFLOW 3.1** - MODFLOW-SURFACT combination offers the most stable platform for simulating complex modeling conditions for the following scenarios:



Saturated/Unsaturated Integration

» Simulating multiple water tables or perched water table systems

» Simulating steep water table gradients crossing multiple model layers

» Simulating over-pumped wells screened across multiple model layers

» Simulating large water table fluctuations causing desaturation or resaturation (drying/wetting) of grid cells

» Simulating soil vapor flow through the unsaturated zone

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* Sold separately

Pumping Effects

All this added functionality and stability wrapped in the industry's #1 program for simulating 3D flow and transport!

Click here and discover all the new advantages of Visual MODFLOW Pro 3.1

Visual Groundwater 3.0 Now Available!

Visual Groundwater 3.0 has pioneered a new frontier in subsurface visualization and animation by combining state-of-the-art graphical tools for 3D visualization and animation with a data management system specifically designed for borehole investigation data. Visual Groundwater 3.0 also comes with these enhancements and new features:

» Derived Variables
» RGB Color Support plus Enhanced Transparency Settings
» New Arcview to MeRaf Converter
» New Surfer to MeRaf Converter
» Enhanced discrete data type
» Inverted Labels
» Animate to Output
» Simplified Macro interface
» Auto Z-Stretch
» Support for Gridded Data covering polar regions

» Support for Reference Lines at all spots on the globe

For more information about Visual Groundwater 3.0 please visit our website

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Consulting News

Incorporation of Karst Geology into Groundwater Vulnerability Mapping

Groundwater vulnerability mapping techniques have typically been designed for overburden settings, as in the standard Intrinsic Susceptibility Index (ISI) technique adopted by Ontario's Ministry of the Environment. WHI, through an initial assessment of the groundwater vulnerability for Grey and Bruce Counties in southwestern Ontario (see Figure A below), highlighted the need to incorporate near-surface karst features into regional vulnerability mapping. The technique being applied to accomplish this includes two steps. Potential karst features along the Niagara Escarpment will first be identified using Ontario Base Maps and subsequently examined during a field survey. The location and extent of each feature will be incorporated into the GIS database for further analysis of groundwater vulnerability. An area adjacent to the existing study area will also be incorporated into an updated analysis of regional groundwater characteristics to develop a final ISI map for the expanded study area. This will provide the necessary information for county planners to develop a Groundwater Protection Plan. For more information on the Grey and Bruce Counties study, please visit the study web site at www.greybrucegroundwaterstudy.on.ca. To find out more about the GIS and groundwater modeling experience of our consulting staff click here or call (519) 746-1798.

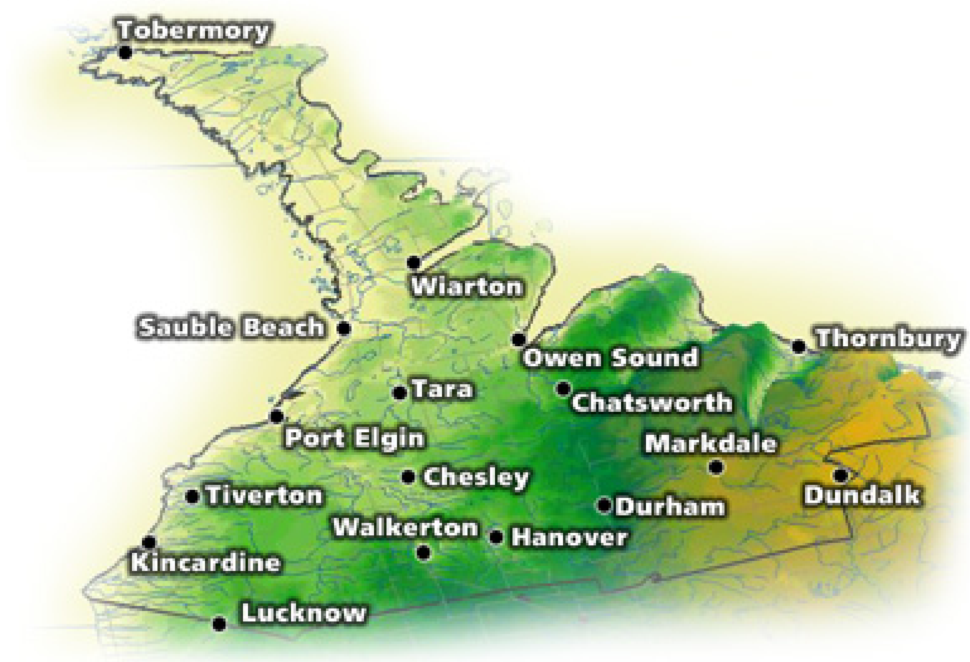

Figure A: Map of Grey and Bruce Counties

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Training News

The Training News section is an excellent resource for locating professional courses related to groundwater and contaminant transport modeling. WHI provides hands-on courses around the world for the novice or expert modeler.

Professional Courses for February	Dates/Locations
Groundwater Modeling • Introduction to groundwater modeling • How to build and calibrate a numeric flow model • Principles of contaminant transport modeling • How to use MODFLOW, Zone Budget, MODPATH, MT3D, and WinPEST Register Now	Waterloo Canada Feb - 18-20
Model Calibration & Predictive Analysis • Theory of nonlinear parameter estimation • Application of nonlinear parameter estimation to model calibration • Analysis of uncertainty and non-uniqueness in calibrated parameters • Effects of parameter uncertainty on model predictive uncertainty Register Now	Waterloo Canada Feb - 21
Click here for our full 2003 training schedule!	

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Tips & Tricks

This month's tips and tricks section provides hints for modeling complex layers in Visual MODFLOW.

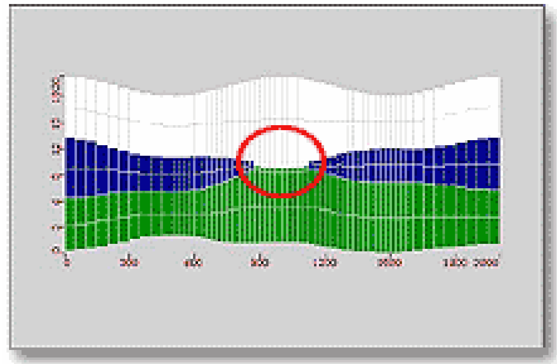

Figure A: Deformed Grid Approach

Modeling Outcropping or Pinching Layers in Visual MODFLOW

MODFLOW is based on a finite difference formulation of the groundwater flow equation requiring all model layers to be continuous across the entire model domain. Each layer is required to have a finite layer thickness in order to assure conservation of mass and hence, the stability and accuracy of the solution. As such, geologic layer pinchouts or outcropping of geologic units at the surface cannot be explicitly represented using a finite difference grid.

However, there are a couple of different approaches you can use to get around this problem.

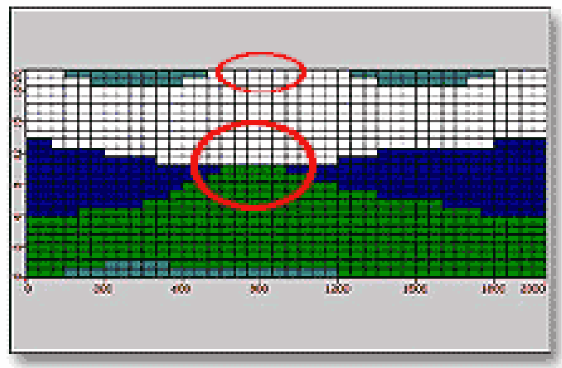

Figure B: Fixed Grid Approach

(1) Deformed Grid Approach: Geologic layer surface elevations are imported to the model layer surfaces in order for the shape of the model grid to represent the shape of the geologic units. In places where the geologic units pinch out, the model layers are pinched down to a very small thickness. Visual MODFLOW allows you to specify a minimum layer thickness when you are importing surface elevations for each model layer. Once the model layer surfaces are imported you can simulate the pinchout by assigning appropriate property values to the cells in the pinchout section (see Figure A).

(2) Fixed Grid Approach: The finite difference grid consists of uniformly flat horizontal layers and the grid cell property values are assigned as needed in order to represent the shape of the geologic units. This approach fully respects the finite difference assumptions and will result in a more stable solution. However this approach is much more difficult to design and modify and is not as attractive for presentation purposes (see Figure B).

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