

Introduction-Developing large, diverse data sets, and constructing three-dimensional geologic and groundwater models

Richard C. Berg, Illinois State Geological Survey, Champaign, IL 61820

L. Harvey Thorleifson, Geological Survey of Canada, Ottawa, ON K1A 0E8

This workshop is designed for those concerned with the development and management of the large, diverse databases that are required for construction of three-dimensional (3d) geologic models and for modeling groundwater flow. Our emphasis is on the data and types of 3-D models needed to portray Quaternary and pre-Quaternary unconsolidated deposits that host potable groundwater and that are the context of most waste-disposal and other environmental issues.

The first key theme focuses on the challenges presented by integrating of large data sets, including both data of variable quality such as logs from water wells, with the crucial high quality data such as from engineering and test boring logs and from geophysics. Presenters will address several of these challenges such as:

- Selecting key stratigraphic boring logs ("golden spikes") and integrating them with lower quality data
- Screening lower-quality data and selecting the "best" information
- Determining data adequacy (scale dependent)
- Developing a viable and user-friendly database

The second key theme concentrates on the use of data to construct 3-D models of the geology. The model may consist of multiple cross sections, fence diagrams, block diagrams, individual isopachous and structure contour (elevation) maps, stack-unit maps, etc. General areas to be addressed by the presenters include:

- Evaluating and using data of variable quality and quantity for constructing 3-D models
- Determining what types of 3-D models "best" portray the geology
- Determining which models are most appropriate for development of derivative maps, such as those needed for groundwater investigations
- Developing internally consistent 3-D models that avoid having lower horizons occurring above upper horizons

The final theme focuses on one important end user of 3-D maps and supporting databases-the groundwater professional-who is charged with modeling the flow and direction of groundwater and whose model results directly will be used for decisions including mitigation/clean-up, water-resource allocations, and other planning and land-use issues. General areas that presenters will address include:

- Evaluating specific end-user needs of hydrologists/hydrogeologists
- Determining specific data requirements of hydrologists/hydrogeologists
- Getting geologists and hydrologists/hydrogeologists interacting to modify and refine 3-D geologic models

- Explaining how hydrologists/hydrogeologist deal with very complex settings

The workshop offers the opportunity for those involved to share their ideas about acquiring, evaluating, and compiling geologic data, constructing 3-D maps, and using 3-D maps and data for groundwater modeling. At some institutions, separate specialists conduct the tasks of compiling geologic data, constructing 3-D maps, and modeling groundwater. However, more commonly, a team of geologists and hydrogeologists perform all three tasks or one individual may perform at least two and perhaps all three tasks. It has become apparent to the workshop convenors that, regardless of who performs the tasks, the methodologies for dealing with large data sets and making 3-D geologic and groundwater models have some differences and some similarities depending on who and where the work is being done. Therefore, the primary goal of the workshop is to encourage interaction between participants from the United States and Canada who have dealt with these challenges.