CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES

TRIP REPORT

SUBJECT: EarthVision® Workflow Manager™ I Course
06002.01.011.011

DATE/PLACE: December 8–11, 2003
Alameda, California

AUTHORS: Shannon L. Colton and Nathan M. Franklin

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PERSONS PRESENT:

Shannon Colton and Nathan Franklin of the Center for Nuclear Waste Regulatory Analyses (CNWRA) attended the EarthVision Workflow Manager I training course and Users' Meeting held in Alameda, California by Dynamic Graphics, Inc., December 8–13, 2003. The instructor of the EarthVision Workflow Manager I course was Robert McFaul.

BACKGROUND AND PURPOSE OF TRIP:

The EarthVision Workflow Manager I course was developed by Dynamic Graphics, Inc. to show attendees how to develop three-dimensional geologic models using the EarthVision Workflow Manager for EarthVision® Version 7.

SUMMARY OF ACTIVITIES:

The course included lectures on how to use the EarthVision Workflow Manager and practice activities. Attendees were provided a workbook entitled "EarthVision® Workflow Manager™." For models created during the course, data for faults and/or horizons were provided in a digital format. Major topics included working with faults, working with horizons, using the formula processor, using volumetrics, and creating property grids. Shannon Colton also attended an EarthVision Users' Meeting December 12–13, where she discussed her use of EarthVision in various projects at the CNWRA.

SUMMARY OF PERTINENT POINTS:

The Workflow Manager provides a user-friendly interface that incorporates many of the commonly used tools for model-building with EarthVision. The user can select a faulted model, a horizon model, or both. If maps such as cross-sections or isochore maps will be created, these options can be selected via the Workflow Manager. The program then guides the user through the steps needed to build an EarthVision model. The steps must be completed in the order that they are listed. Incomplete steps are shown with a red light beside them, steps currently being processed are shown in yellow, and completed steps are shown in green.

When creating a model in EarthVision, the first step is to provide model information. The user specifies a coordinate system, an ellipsoid, and the units. The user also must determine if the model will be a depth or elevation model. Depth models are typically used for seismic data.

Fault building is the second step in three-dimensional geologic model creation. EarthVision allows a user to enter information describing the faults in the model by inputting files with scattered data, EarthVision 2D grid files, or an ASCII grid with separate files for each fault. EarthVision then models each fault through the entire model range. In order to show the fault only where it occurs, the fault must either terminate by intersecting another fault or the user must define a polygon boundary for the fault. Fault boundary polygons can be automatically computed in EarthVision 7 from scattered data fault files. For example, the user can specify an ellipse that steps out 10 percent of the range of scattered fault data. If the input data is already in the form of a grid, the user must draw the fault boundary polygon manually with the EarthVision Graphic Editor. With fault information loaded, the user then builds a fault tree. A fault tree is a hierarchy of faults that tells EarthVision which faults are terminated or which faults terminate other faults at fault intersections. This fault tree can be built manually, but EarthVision 7 does have an automatic fault tree builder that detects which fault should continue at each intersection based on the density of data points each fault has on each side of the fault intersection. Finally, the user specifies the type of visual output wanted for the fault model. The output can be fault blocks, fault surfaces, or a fault preview file. Note that the fault preview file is different than the fault block and fault surfaces files in that it does not clip faults at intersections, and it displays the input data along with fault grids. Note that if the user changes the input data for one fault, he/she will have to re-calculate the entire fault model again because each fault grid affects the other fault grids as well. Faults also affect horizon grids in faulted horizon models, so horizons will also have to be recomputed.

The third step is to provide horizon information. The user specifies the stratigraphic sequence of horizons and provides input data. Well-defined horizons are referred to as reference horizons; other horizons are called intermediate horizons. Reference horizons are gridded only from their own data. Intermediate horizons are gridded using both data from the intermediate horizon and nearby reference horizons. The horizons can be calculated from scattered data (reference or intermediate horizon), a constant (reference horizon if a constant elevation; intermediate horizon if a constant thickness), a thickness grid (intermediate horizon), or a percentile of thickness between two horizons (intermediate horizon). The user then selects a geologic operation for each horizon: deposition, channel erosion, or unconformity. This controls intersection behavior of horizons. Gridding parameters must then be specified. One option is a minimum tension grid throughout the range of the model. The default is minimum tension with trend control. This uses the EarthVision minimum tension gridding algorithm where there is a high density of input data but uses the general trend of data where there are few data points. A third option is to use only trend control. This should only be used when the user's input data is sparse. The user needs at least three data points to use trend gridding.

After completing a faulted horizon model, the user can view their model in three-dimensional as well as make isochore maps and various structure maps. In the course of learning the steps involved in the Workflow Manager, students also learned how to use the 3D Viewer and the Graphic Editor.

The course also covered the capabilities of the Formula Processor, including multiplying grids, calculating thicknesses, back-interpolation (prediction of a z value given x and y locations) from

grids, logical functions, and constant values, property modeling with three-dimensional grids, and the use of Volumetrics for volume calculations.

CONCLUSIONS:

The course is useful for anyone who is new to EarthVision, as it walks the student through the steps involved in creating a complex EarthVision model and explains how the program interprets data. However, as an introductory course, it might not be useful for those who have already used EarthVision extensively.

PROBLEMS ENCOUNTERED:

None.

PENDING ACTIONS:

None.

RECOMMENDATIONS:

EarthVision 7 provides many new capabilities over EarthVision 5.1 (such as automatic fault boundary polygon building and automatic fault tree building). I recommend that we begin using EarthVision 7 as soon as possible, pending software validation testing.

SIGNATURES:

Shannon Colton — Mar 4, 2004

Shannon Colton
Scientist

Date

CONCURRENCE:

Larry McKague — 03/04/04

Larry McKague, Manager
Geology and Geophysics

Date

Budhi Sagar — 03/05/04

Budhi Sagar
Technical Director

Date