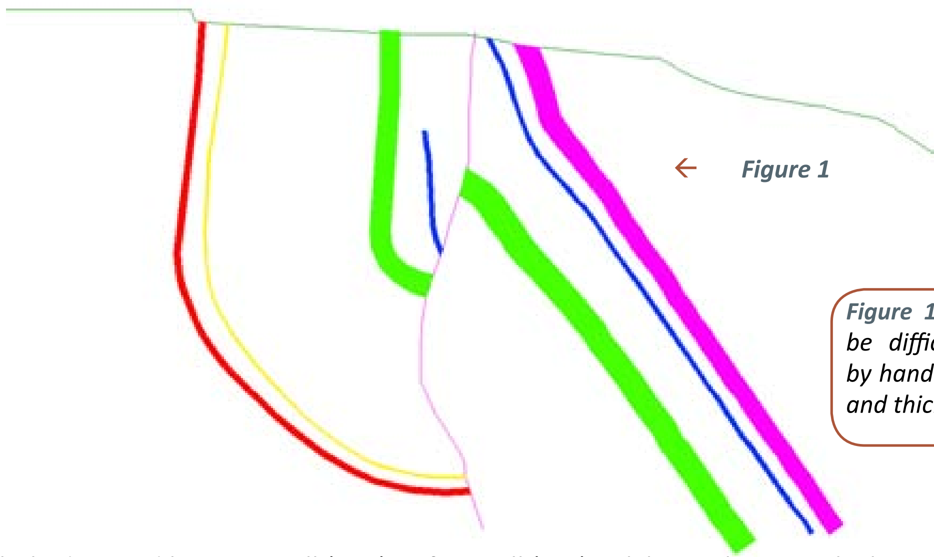
MS3D: True Thickness Tools

True Thickness tools are a semi-automated alternative to the traditional method of digitizing sectional polygons by hand.

It can be difficult to create polygons of bedded or veined deposits when such deposits have variable dip or thickness, and widely spaced drilling, as shown in Figure 1



← *Figure 1*

Figure 1 The seams shown would be difficult to accurately digitize by hand because of the varying dip and thickness.

Based on drillhole data and hanging wall (HW) or footwall (FW) polylines, the True Thickness tools calculate the dip and true thickness of a geologic structure at each drillhole intersection. They store the information back into the drillhole file, and then interpolate the thickness to each node on each seam polyline to create sectional polygons representing the structure. These polygons can then be coded directly into the block model or linked into a solid for coding.

It's a six-step process:

1. Create a composite file with appropriate items
2. Digitize HW or FW polylines on wider spaced sections and link to surfaces
3. Slice the surfaces into polylines for each model row or column
4. Calculate the seam dip and true thickness at each drillhole-seam intersection
5. Construct the seam polygons by interpolating true thickness
6. Code from polygons or a linked solid

1 Step 1. Create Composite File with Seam Dip and Thickness Items

First create a composite file containing items for True Thickness (TTHK), Seam Dip, (SDIP), and a seam code (SEAM). Then composite the seam intervals using procedure **p50101.dat** with a large fixed length honoring geology to properly store the seam intervals into the composite file.

*Note: Procedure **p50102.dat**, which is specifically designed for seam compositing, composites from the top of the first occurrence to the bottom of the last occurrence of each seam. However, this method is not appropriate for deposits with over-thrusts or repeats, so use **p50101.dat**.*

Step 2. Digitize HW/FW Polylines and Build a Surface

Digitize polylines representing either the HW or FW of each seam on sections oriented to match the drilling. This process also applies to faults, which can be used to clip or extend the final seam polygons when they are constructed in Step 5.

Smooth, densify, and link together the polylines into surfaces (Figure 2).

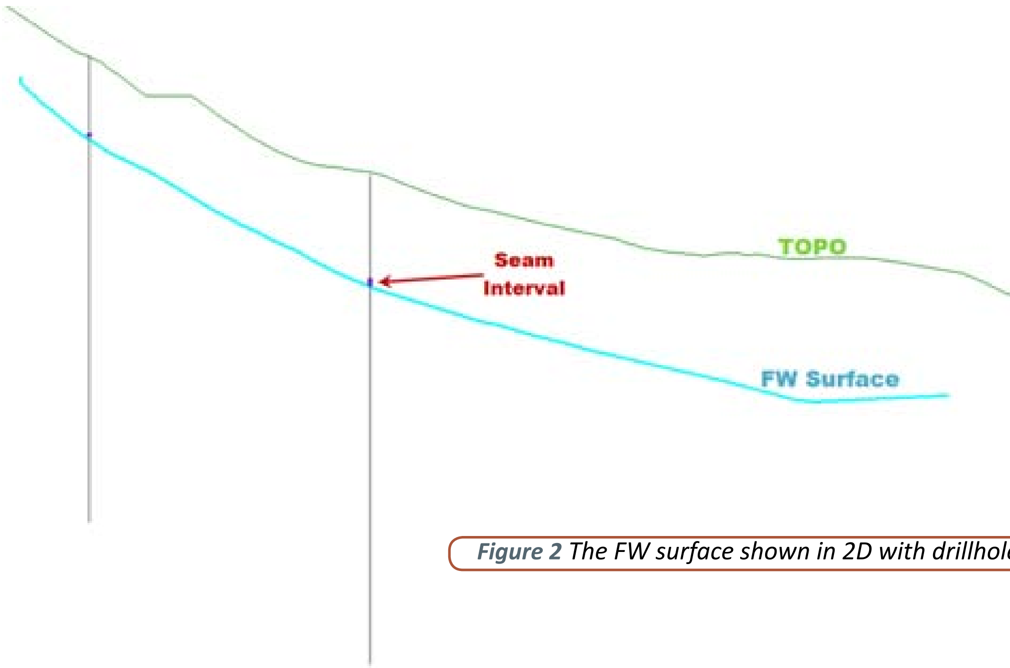


Figure 2

Figure 2 The FW surface shown in 2D with drillhole seam Intervals

The example in Figure 3 shows in 3D the linked FW surface of a coal seam along with the polylines used to create it. ***The material associated with the surface should have a model code value corresponding to the seam code.*** This material, and its code, will be carried through all the intermediate steps. When the seam dips are computed and the seam polygons constructed, this code value will be used to match the polylines to the composite seam intervals. If the FW/HW surface is attributed, the attributed material is used. Otherwise, the material will be taken from the geometry object containing the surface.

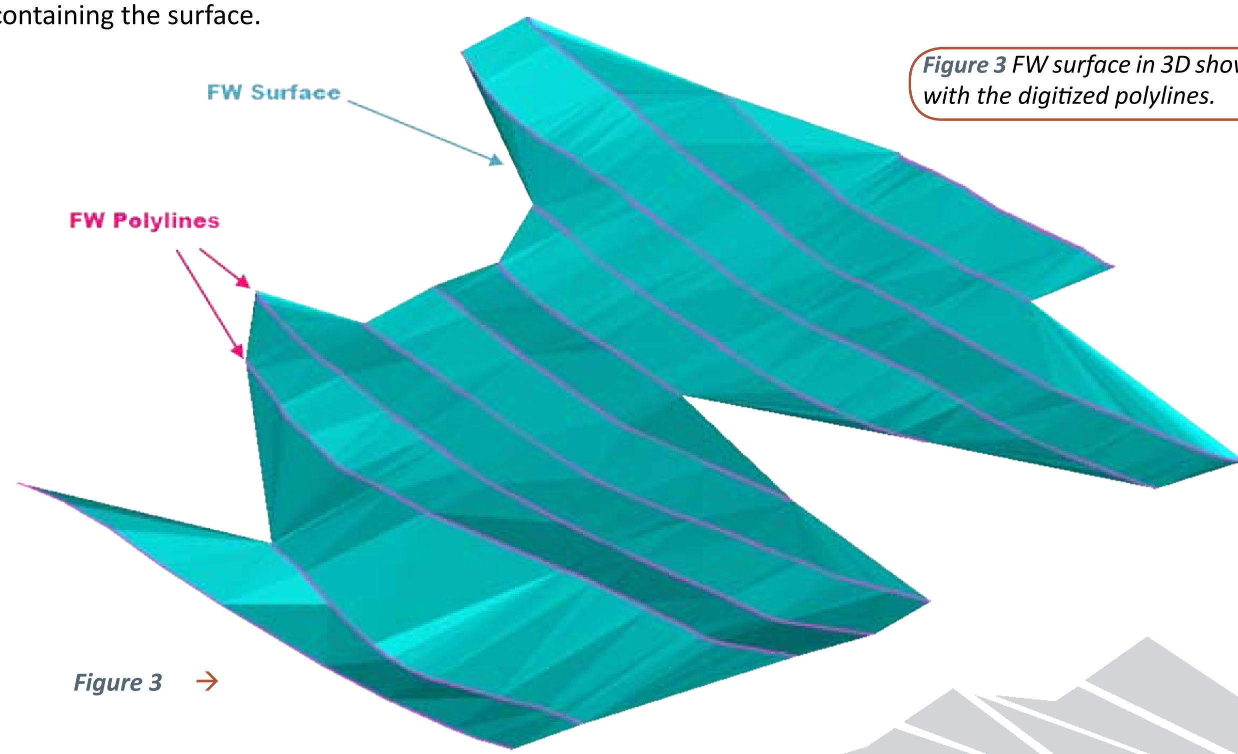


Figure 3 FW surface in 3D shown with the digitized polylines.

Figure 3

3 Step 3. Slice Surface into Polylines at Block Centers

Slice the FW/HW surfaces to create a polyline at the center of each block model column or row using **Data Manager | Slice View**. The resulting polylines are shown in Figure 4 and have the same material as the surface from which they were generated. These polylines should be smoothed and densified to at least the block width as shown in Figures 5a and 5b.

Figure 4 Polygons created by slicing the FW Surface

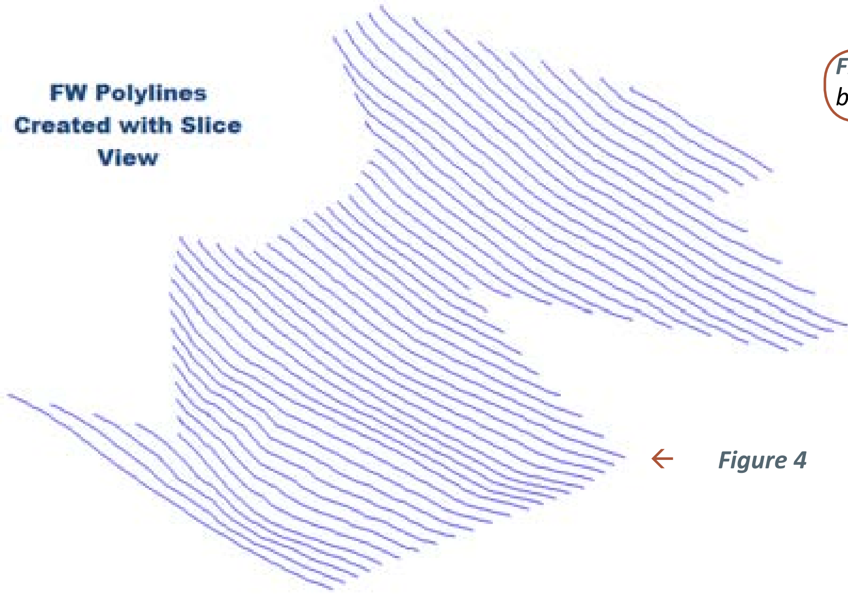


Figure 4

Figure 5a

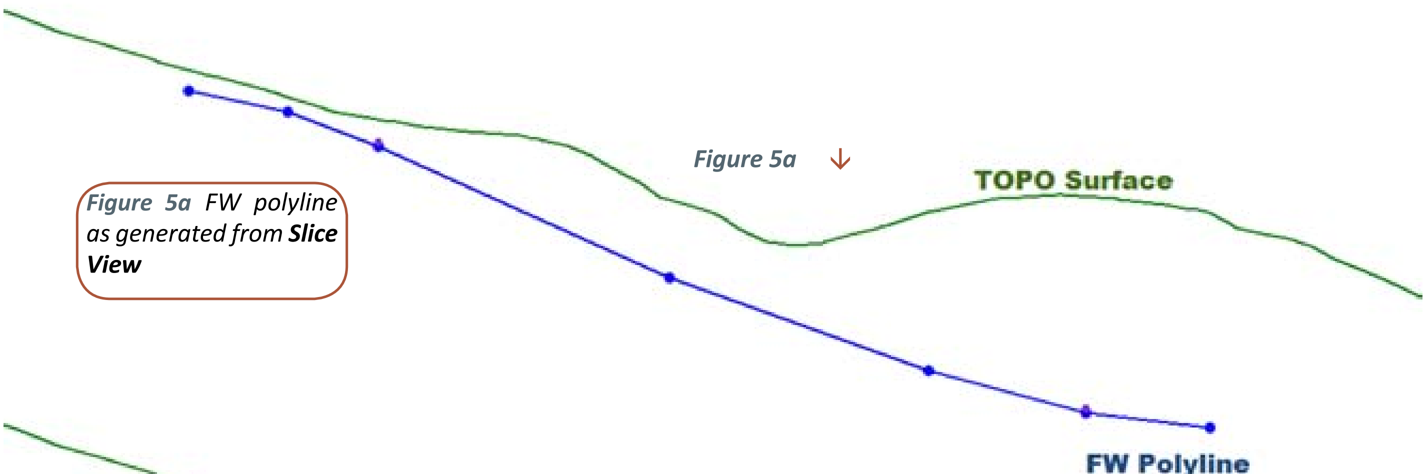


*Figure 5a FW polyline as generated from **Slice View***

Figure 5b

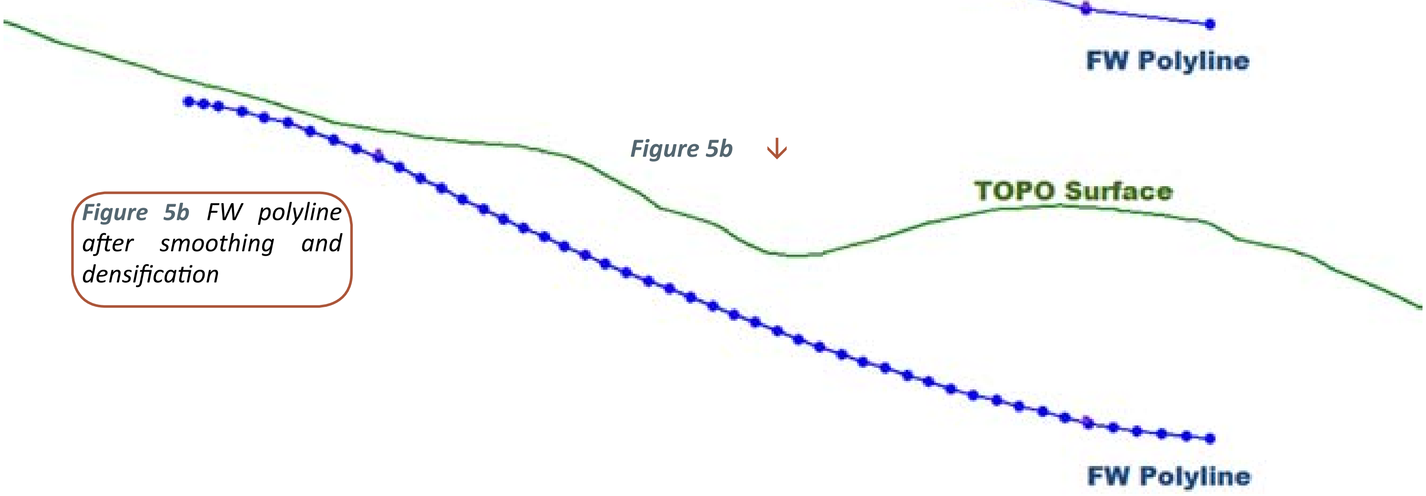


Figure 5b FW polyline after smoothing and densification

4 Step 4. Calculate Seam Dip and True Thickness

After creating and editing the FW/HW polylines, calculate seam dip and true thickness using **Assign Seam Dips** under **Geo Tools | True Thickness Tools** (Figure 6).

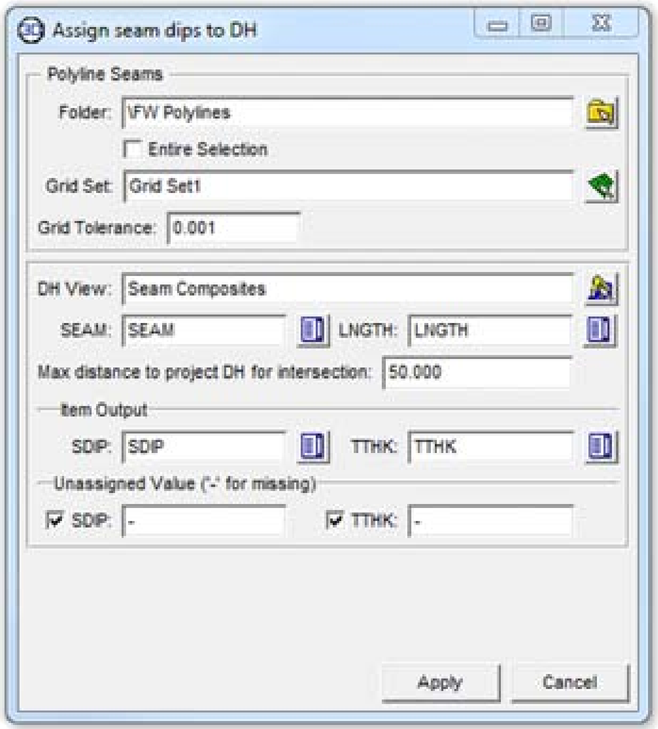


Figure 6

Figure 6 ***Assign Seam Dips***

Seam dips at each interval (SDIP), as well as the true thickness (TTHK), are calculated based on the selected FW/HW polylines and the seam lengths stored in the composite file along with the surfaces material model code value (SEAM), as shown in Figure 7.

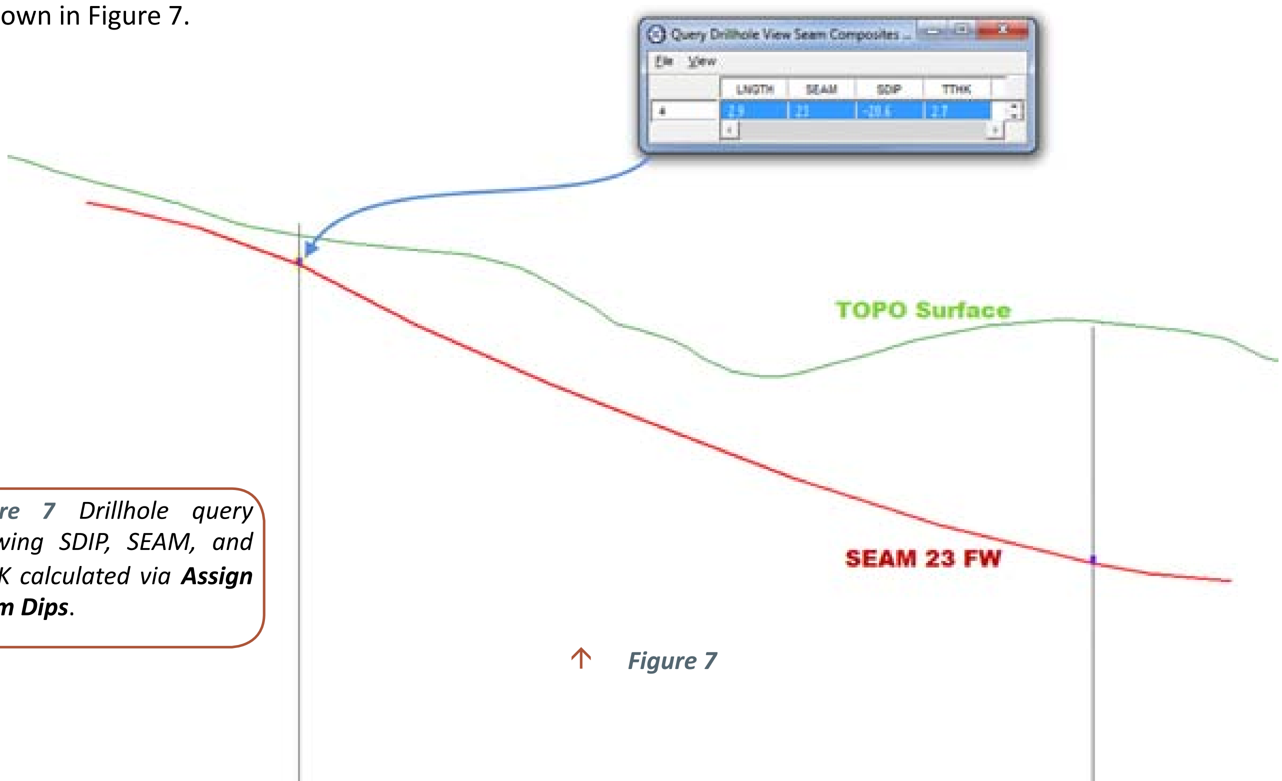


Figure 7

Figure 7 Drillhole query showing SDIP, SEAM, and TTHK calculated via ***Assign Seam Dips****.*

Step 5. Construct Seam Polygons

Next use **GEO Tools |True Thickness Tools | Construct seam polygons** to interpolate the thickness of the seams using the dip and true thickness values stored in the composite file. Create polygons using the interpolated values from the FW/HW polylines (Figure 8). Since these polygons are built from the slice view polylines, they will inherit the material, and thus the model code corresponding to the seam code, from the original HW/FW surface.

If you also generated polylines for TOPO, overburden, or faults, the seam polygons can be either clipped or extended to these polylines using the options on the **Seams** and **Output** tabs.

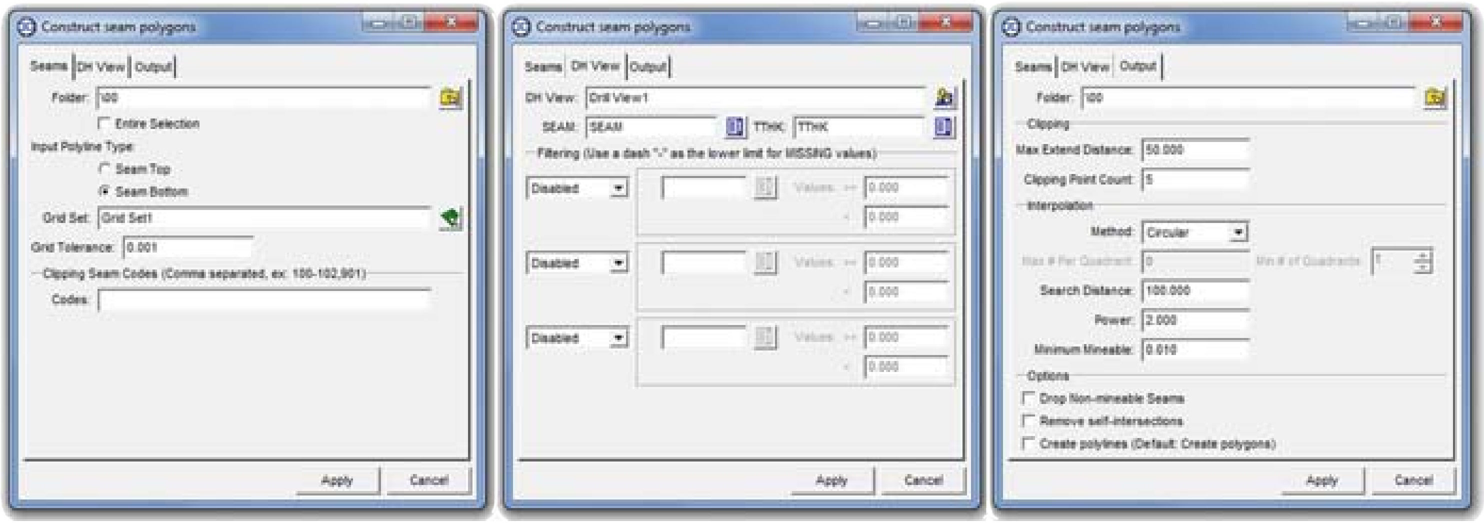


Figure 8

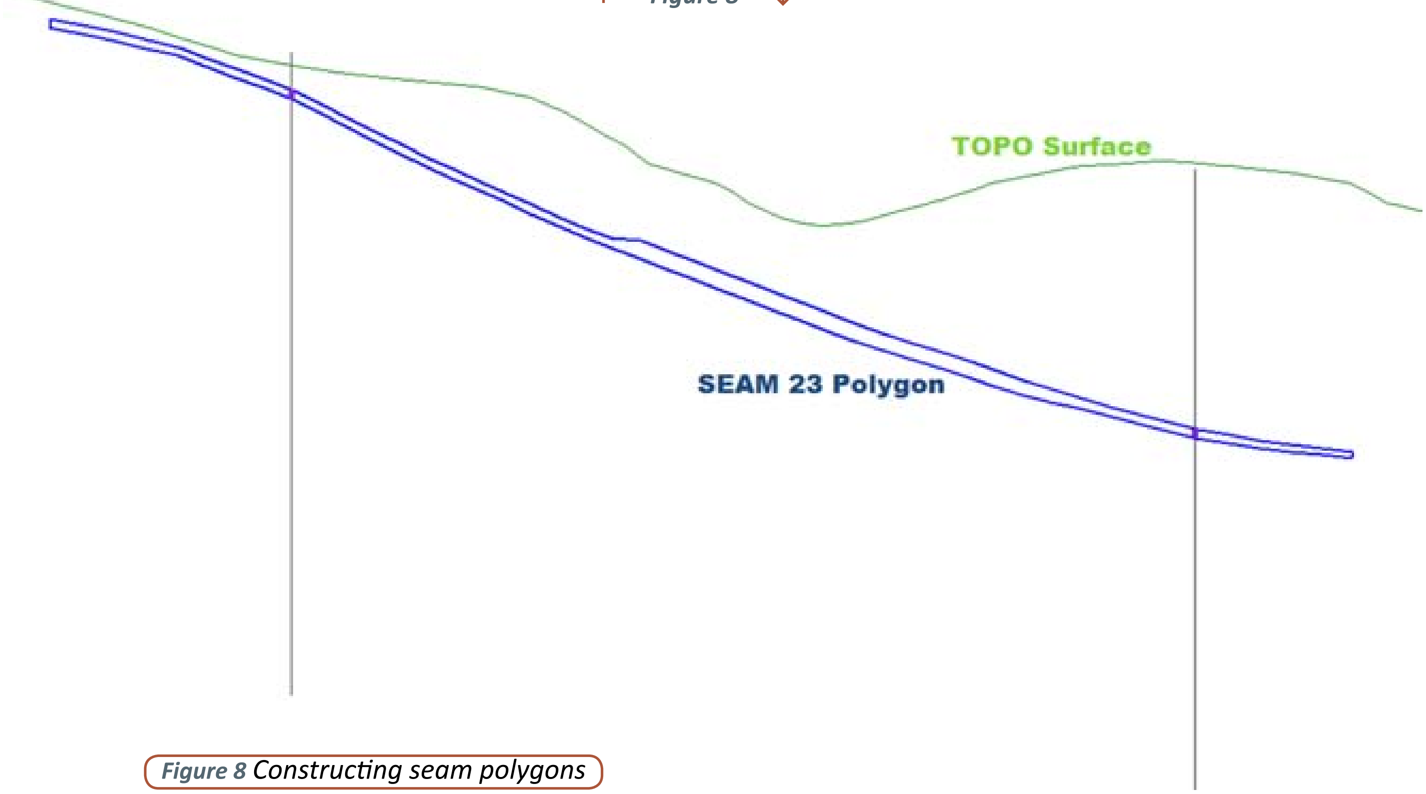
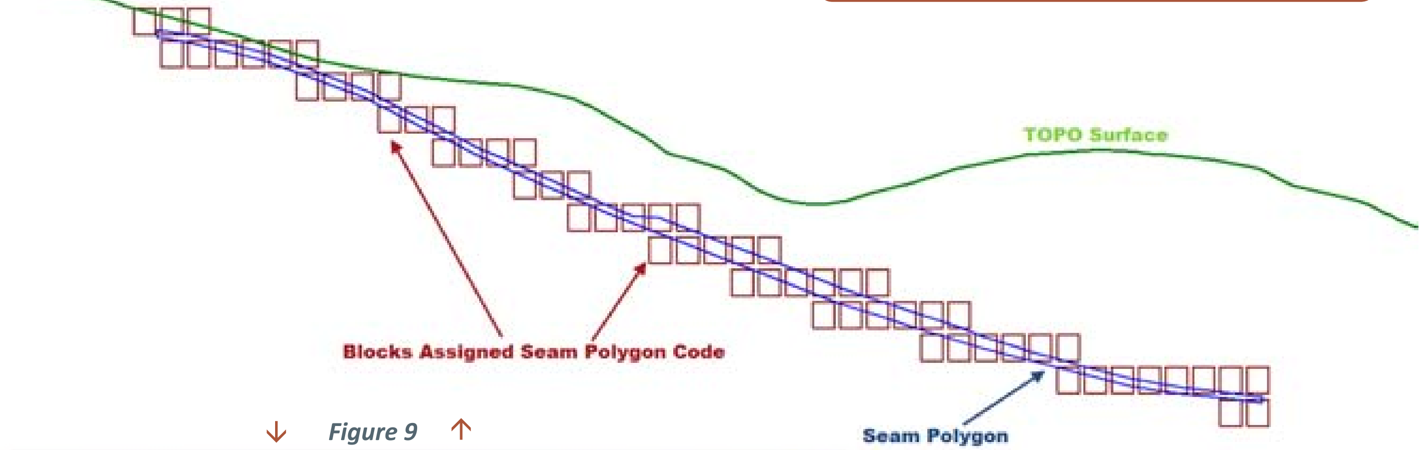


Figure 8 Constructing seam polygons

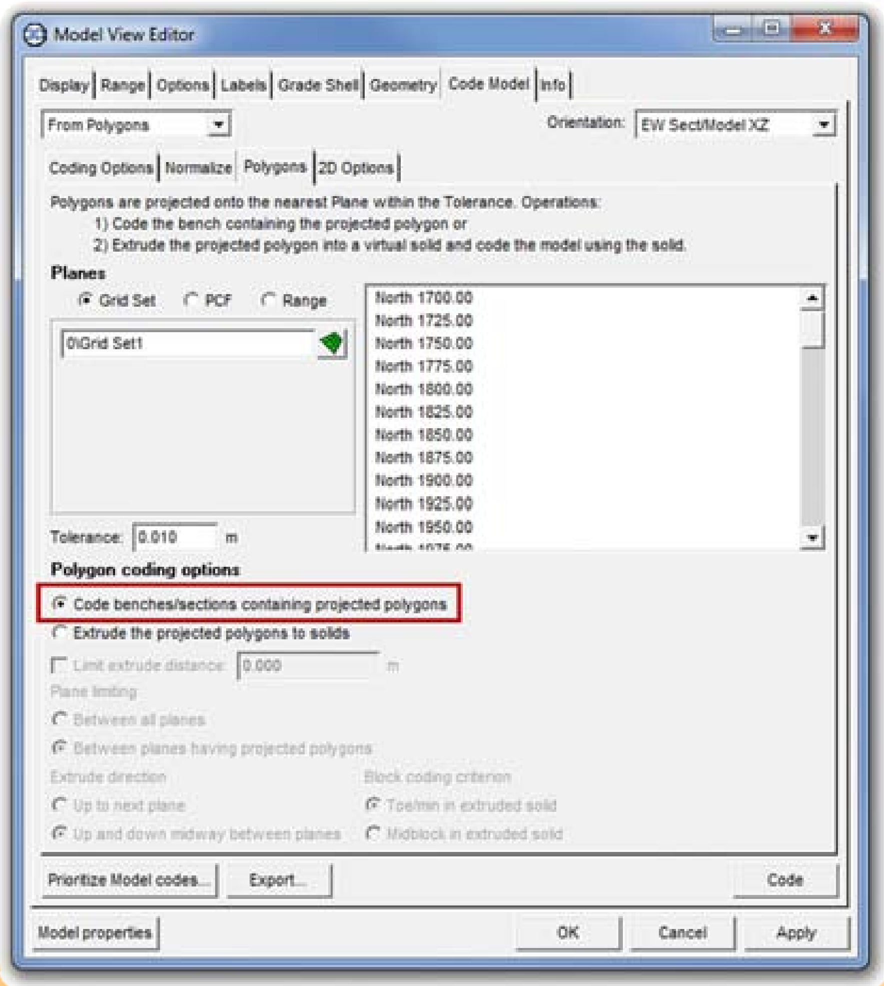
Step 6. Coding Options

The seam polygons can be coded directly into the model. Since they were created at the center of each block column or row, use the option to **Code benches/sections containing projected polygons** and specify the planes by using the grid set that created the Slice View (Figure 9).

Figure 9 *Blocks coded from the seam polygon*



↓ *Figure 9* ↑



For more coding accuracy, the seam polygons can be linked into a solid. For complex deposits this can be time consuming. The increased accuracy may not warrant the additional time. Therefore, coding from polygons is often the preferred method.