PolyMap Tutorial

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1) Prior to Running PolyMap

1.1. First Steps

You should already have a MicroMODEL project folder created, since PolyMap generally works in conjunction with a MicroMODEL project. It is suggested that you create a folder directly underneath the MicroMODEL project folder. Alternatively, create a folder that is at the same level as the MicroMODEL folder. The MicroMODEL tutorial is based on the demo project stored in F:\Projects\MMDemo. We have created a PolyMap folder F:\Projects\PMDemo.

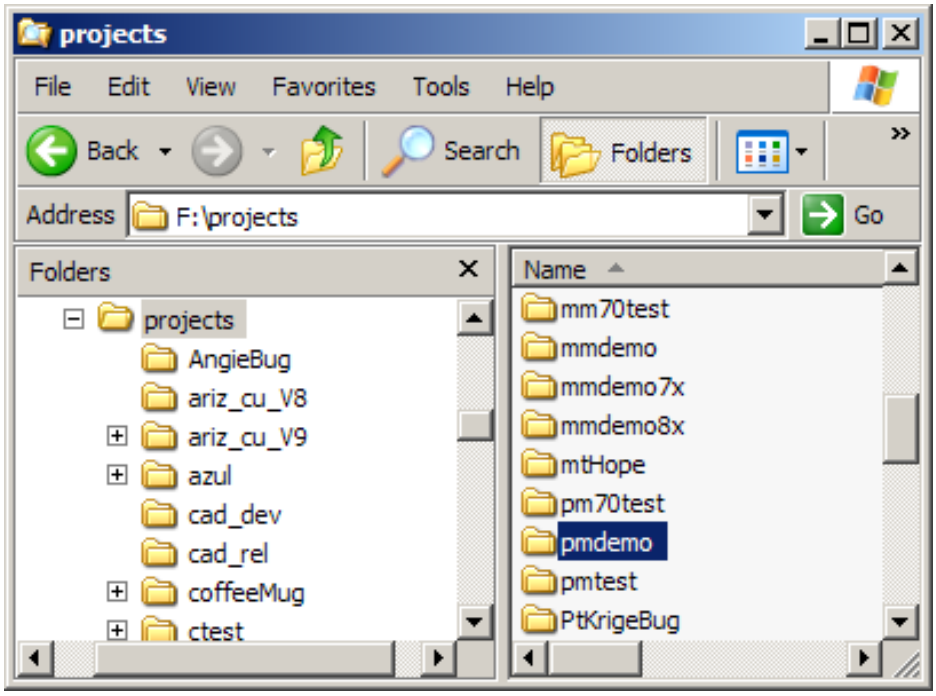


Figure 1 Screenshot of Windows Explorer Showing pmdemo Folder

1.2. Preparing DXF Files

DXF Files are used by PolyMap for importing topography surfaces, and other features such as property boundaries.

To import the topography from digitized contour data, make sure that all the relevant contour lines are on layers separate from extraneous data (such as road indicators or other infrastructure), and that the contours are either lines, polylines, or lwpolylines. When loading the topo information, it is possible to pick and choose the necessary layers. Just make sure the contour data is consolidated on a few layers and independent of any other entity types.

1.3. Help

If you have questions about a particular input item for a program, navigate to the field you have questions about, and then click on the Help button, located in the lower right hand corner of the screen. In most cases, a small help dialog will appear which should explain what PolyMap is looking for. If you do not get a popup help, please make a note of the program and field and send a short note to Martin and Associates so that this oversight can be corrected.

2) System Setup

1.4. Enter/Change Project Information

(Data Entry – 3 Enter Project Information)

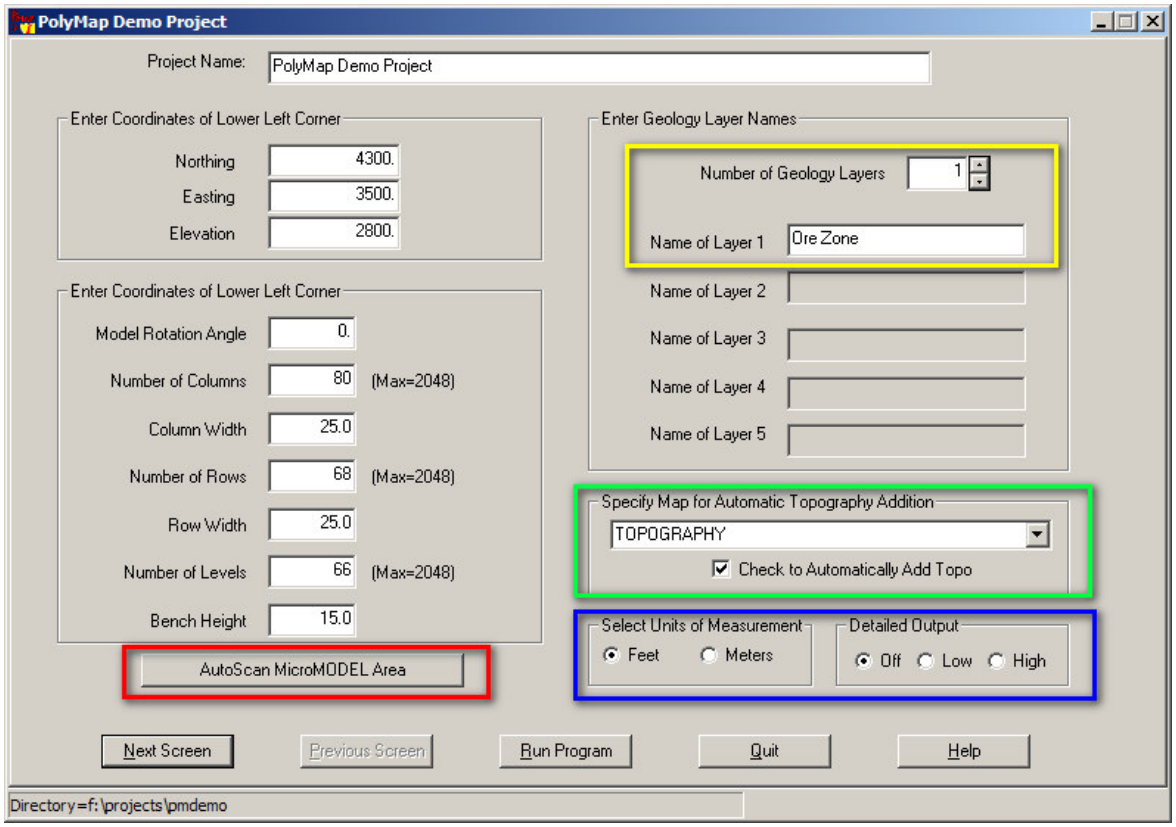


Figure 2 Project Information Entry Dialog Box

1) The easiest way to setup Polymap is to AutoScan the associated MicroMODEL area by pressing this button. (**Red**)
2) If this is a stand-alone project, you may enter the lower left corner coordinates, rotation angle, and block parameters.
3) If you are going to use PolyMap to draw geologic zones, then enter the number of different layers you will be defining, and the name of each layer. In this case, we are going to draw ore zones.(yellow)

4) Automatic Topography Addition will draw the topo profile on section maps, and draw bench midline contours on plan maps. In this case, we have selected a previously defined map called TOPOGRAPHY to use and we have elected to automatically add the topo. With the automatic option checked, the first time that you go to add geology on a particular map, the topoline will be added on the fly prior to starting the geology input program. Note that if you were setting up this project for the first time, there would be no maps available to select. These two fields would need to be updated, once a map called TOPOGRAPHY was added to the project.(green)
5) Select the units (feet/meters) and the level of output. Detailed output off is sufficient in most cases. High level of detailed output is generally used only when analyzing the map updating process.(blue)

In the second screen, we define the line names and area names to use with our ore zone layer.

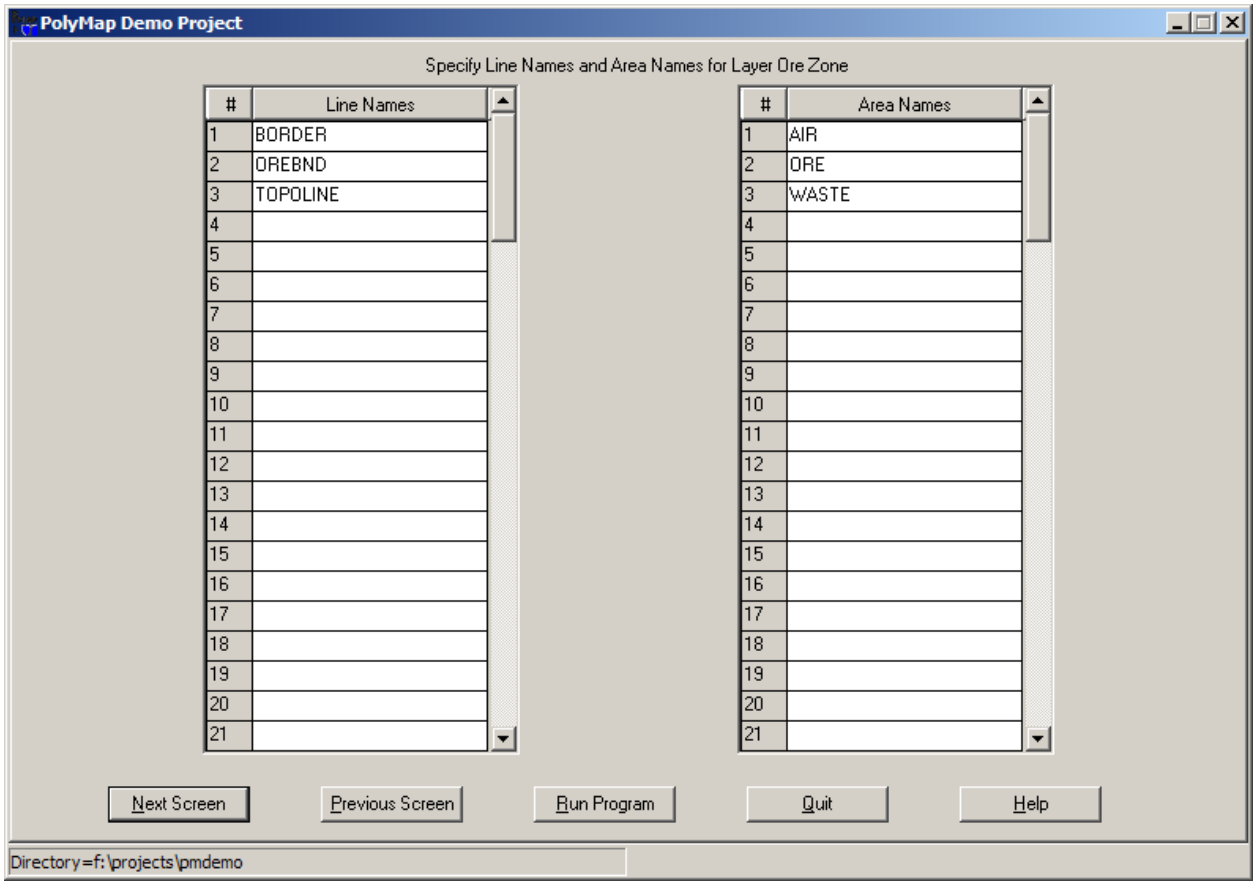


Figure 3 Line and Area Name Input Screen

1) If you are only using PolyMap for pit design, then there is no need to define lines and areas. For our demo, we are going to define air, ore, and waste zones using boundary lines border, orebnd, and topoline.

➢ **[Run Program]**

3) Add Maps to Project

After setting the project limits, the next step is to define one or more maps to work with. A map is simply an entry in the project map database. Up to 2000 maps can exist in a given Polymap project. Each map must be defined as one of six types: Plan Map, N-S Section Looking East, N-S Section Looking West, E-W Section Looking North, E-W Section Looking South, or Angled Section. Maps can be added one at a time, or in multiple groupings of the same map type.

If a plan map is added with an elevation set to zero, then this map is treated as a topography or pit design map, rather than as a geology map.

There is a separate choice in system setup, Add Maps from MicroMODEL section Locations, that can be used to define matching sections in PolyMap to those used in MicroMODEL.

1.5. Adding TOPOGRAPHY

First, we will add a single plan map called TOPOGRAPHY to our project. We will use this map to store the digitized topography contours. System Setup > Add Maps to the project:

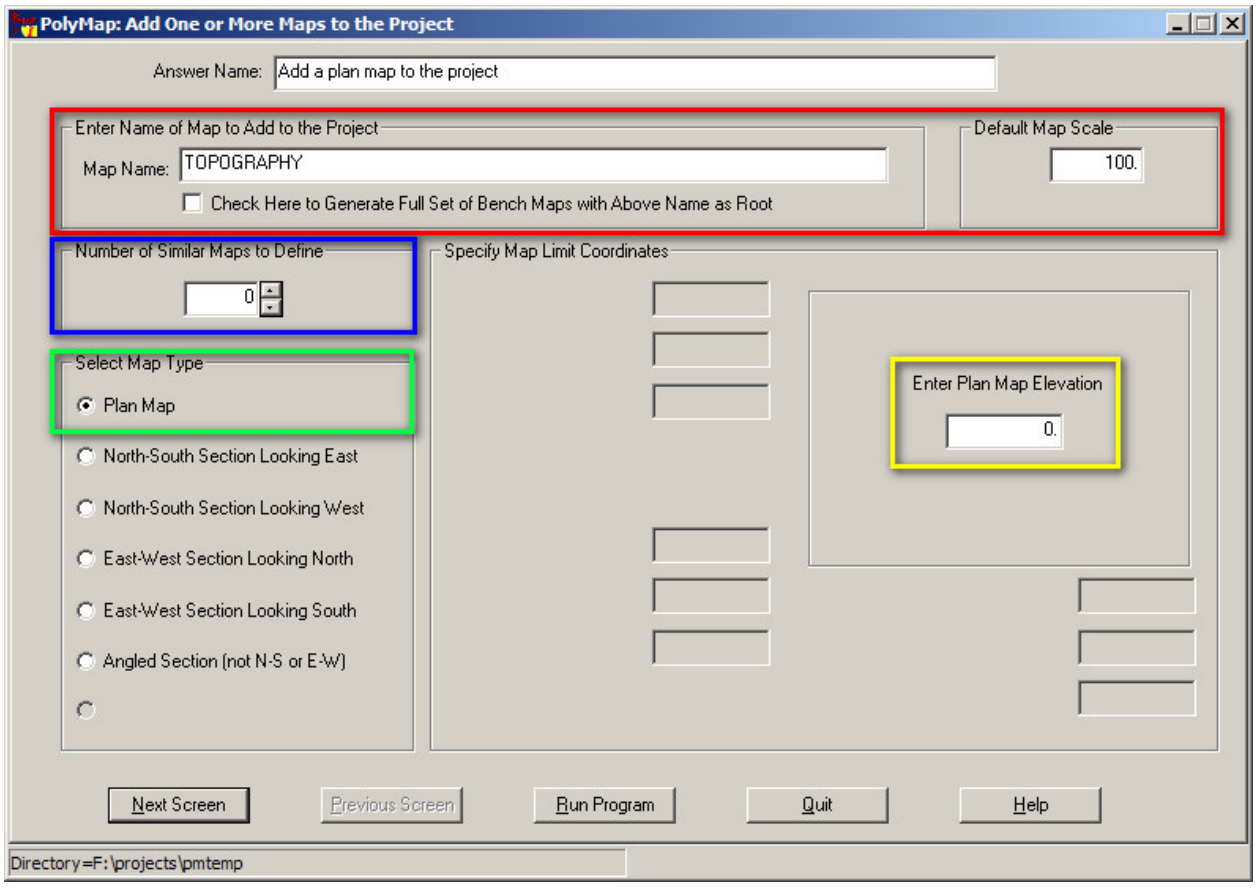


Figure 4 Add map TOPOGRAPHY to Project Dialog

1) Type in the name of the map, TOPOGRAPHY. The default map scale only applies if you are going to use a digitizing tablet to enter map data. If you will be digitizing the data, then enter the scale of the map from which you will be digitizing. Otherwise, leave this value at 100.(red)
2) We are only defining TOPOGRAPHY at this point, so the number of similar maps to define is left at zero.(blue)
3) We are defining a plan map.(green)
4) Leave the elevation of all topography and pit design maps at zero. This is a flag to PolyMap that differentiates a topography map from a geology bench plan. In the rare case where you need to actually create a bench geology map at mid-bench elevation zero, enter 0.001 instead.(yellow)

1.6. Adding Bench Geology Maps

A complete set of bench geology maps can be added in one step.

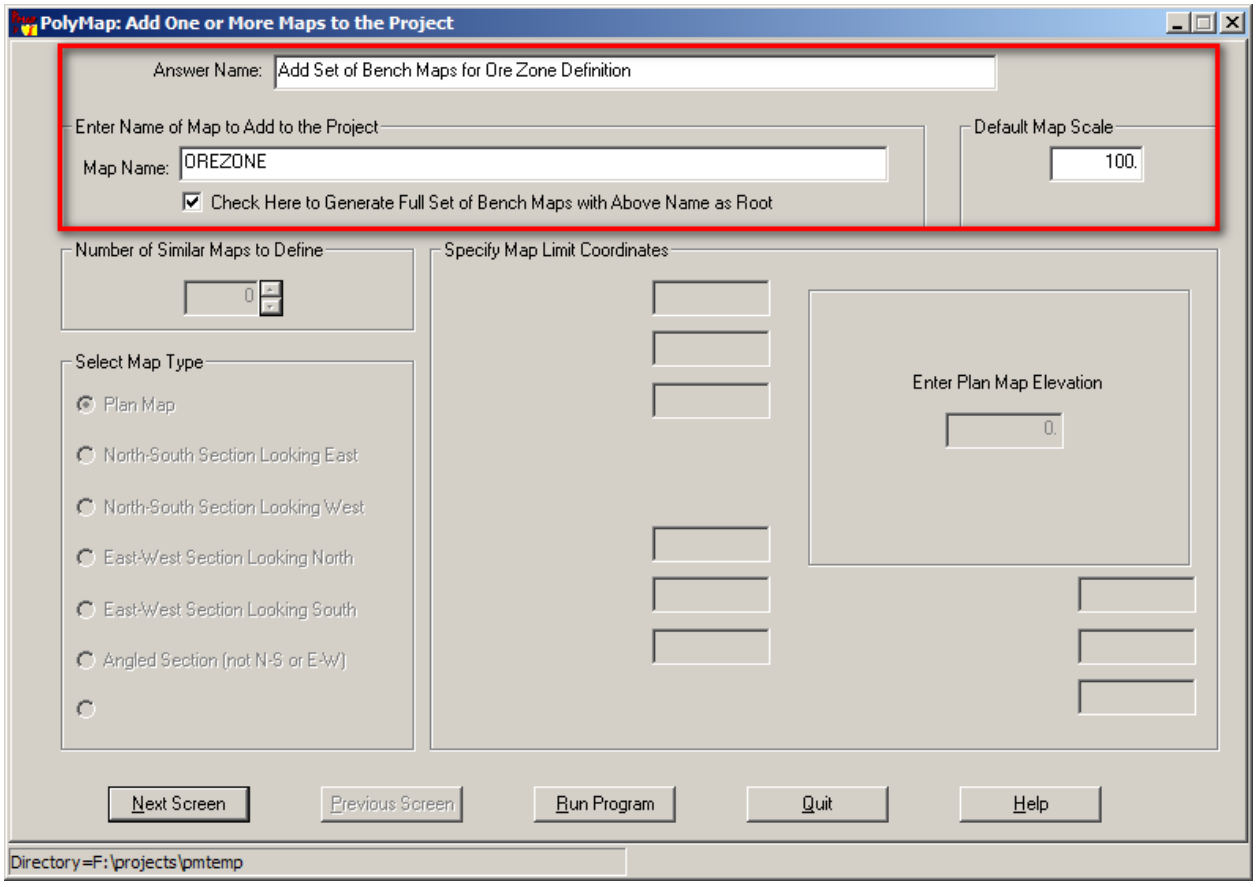


Figure 5 Add Set of Bench Maps for Ore Zone Definition Dialog

1) Change the answerset to an appropriate name. Enter the root name to use for all of the level plans (bench maps). Be sure the checkbox is selected.(red)

2) Run Program. Use Display Current Map File Information to get a list of the maps that were created. There is one for each of the 66 levels in the project. PolyMap takes the root name and adds "_BENCH_TOE_xxxx.x" to form the map names. Here is a partial listing:

```
| PolyMap Geologic Modeling Software  -  Version 4.00
  Project: PolyMap Demo Project

 Map#      Map Name                                                  Map Type

   1 OREZONE_BENCH_TOE_2800.0 . . . . . . . . . . . . . . . . . . . . Plan
   2 OREZONE_BENCH_TOE_2815.0 . . . . . . . . . . . . . . . . . . . . Plan
   3 OREZONE_BENCH_TOE_2830.0 . . . . . . . . . . . . . . . . . . . . Plan
   4 OREZONE_BENCH_TOE_2845.0 . . . . . . . . . . . . . . . . . . . . Plan
   5 OREZONE_BENCH_TOE_2860.0 . . . . . . . . . . . . . . . . . . . . Plan
   6 OREZONE_BENCH_TOE_2875.0 . . . . . . . . . . . . . . . . . . . . Plan
   7 OREZONE_BENCH_TOE_2890.0 . . . . . . . . . . . . . . . . . . . . Plan
   8 OREZONE_BENCH_TOE_2905.0 . . . . . . . . . . . . . . . . . . . . Plan
   9 OREZONE_BENCH_TOE_2920.0 . . . . . . . . . . . . . . . . . . . . Plan
  10 OREZONE_BENCH_TOE_2935.0 . . . . . . . . . . . . . . . . . . . . Plan
  11 OREZONE_BENCH_TOE_2950.0 . . . . . . . . . . . . . . . . . . . . Plan
  12 OREZONE_BENCH_TOE_2965.0 . . . . . . . . . . . . . . . . . . . . Plan
  13 OREZONE_BENCH_TOE_2980.0 . . . . . . . . . . . . . . . . . . . . Plan
  14 OREZONE_BENCH_TOE_2995.0 . . . . . . . . . . . . . . . . . . . . Plan
  15 OREZONE_BENCH_TOE_3010.0 . . . . . . . . . . . . . . . . . . . . Plan
  16 OREZONE_BENCH_TOE_3025.0 . . . . . . . . . . . . . . . . . . . . Plan
  17 OREZONE_BENCH_TOE_3040.0 . . . . . . . . . . . . . . . . . . . . Plan
  18 OREZONE_BENCH_TOE_3055.0 . . . . . . . . . . . . . . . . . . . . Plan
  19 OREZONE_BENCH_TOE_3070.0 . . . . . . . . . . . . . . . . . . . . Plan
  20 OREZONE_BENCH_TOE_3085.0 . . . . . . . . . . . . . . . . . . . . Plan
  21 OREZONE_BENCH_TOE_3100.0 . . . . . . . . . . . . . . . . . . . . Plan
  22 OREZONE_BENCH_TOE_3115.0 . . . . . . . . . . . . . . . . . . . . Plan
  23 OREZONE_BENCH_TOE_3130.0 . . . . . . . . . . . . . . . . . . . . Plan
  24 OREZONE_BENCH_TOE_3145.0 . . . . . . . . . . . . . . . . . . . . Plan
  25 OREZONE_BENCH_TOE_3160.0 . . . . . . . . . . . . . . . . . . . . Plan
  26 OREZONE_BENCH_TOE_3175.0 . . . . . . . . . . . . . . . . . . . . Plan
  27 OREZONE_BENCH_TOE_3190.0 . . . . . . . . . . . . . . . . . . . . Plan
  28 OREZONE_BENCH_TOE_3205.0 . . . . . . . . . . . . . . . . . . . . Plan
  29 OREZONE_BENCH_TOE_3220.0 . . . . . . . . . . . . . . . . . . . . Plan
  30 OREZONE_BENCH_TOE_3235.0 . . . . . . . . . . . . . . . . . . . . Plan
  31 OREZONE_BENCH_TOE_3250.0 . . . . . . . . . . . . . . . . . . . . Plan
  32 OREZONE_BENCH_TOE_3265.0 . . . . . . . . . . . . . . . . . . . . Plan
  33 OREZONE_BENCH_TOE_3280.0 . . . . . . . . . . . . . . . . . . . . Plan
  34 OREZONE_BENCH_TOE_3295.0 . . . . . . . . . . . . . . . . . . . . Plan
```

1.7. Add Sections from MicroMODEL

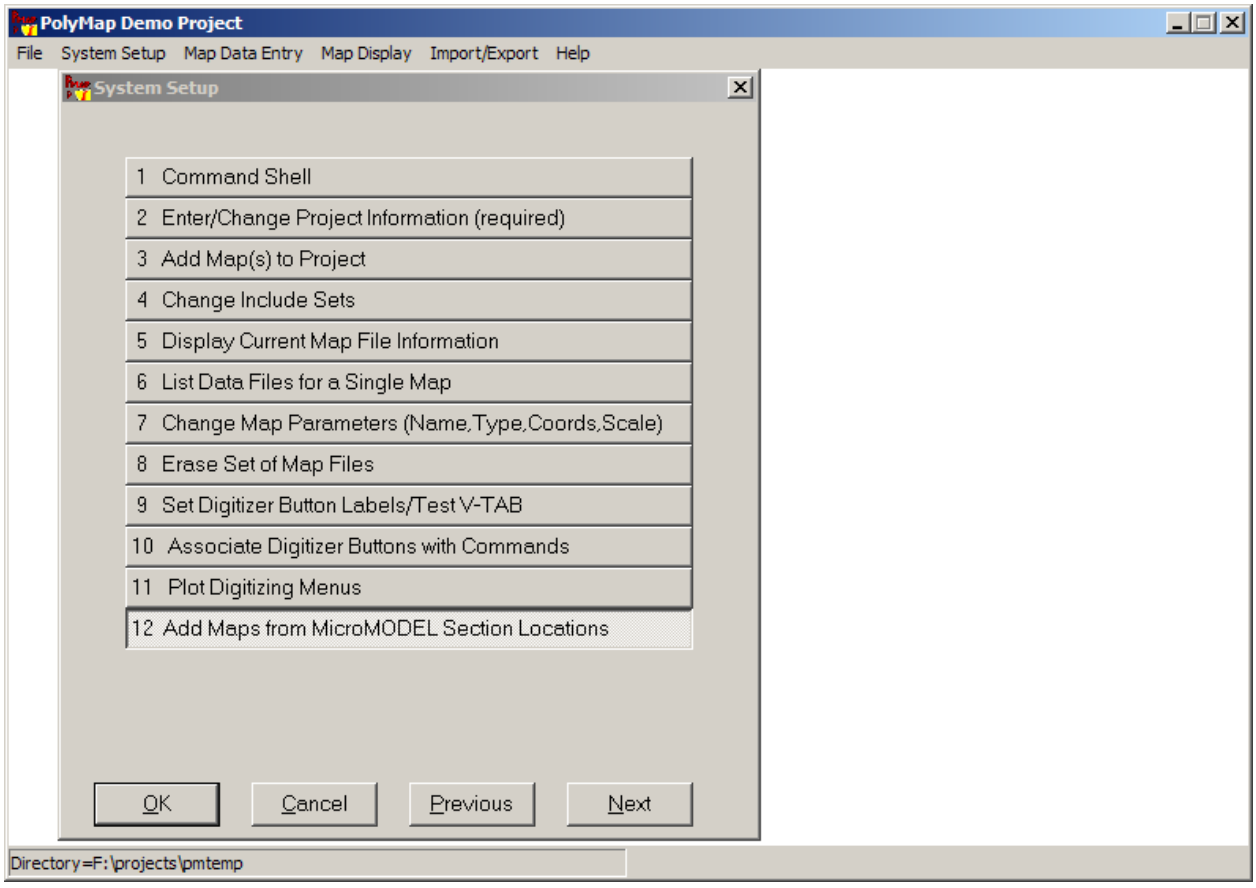


Figure 6 Choose Add Maps from MicroMODEL Section Locations

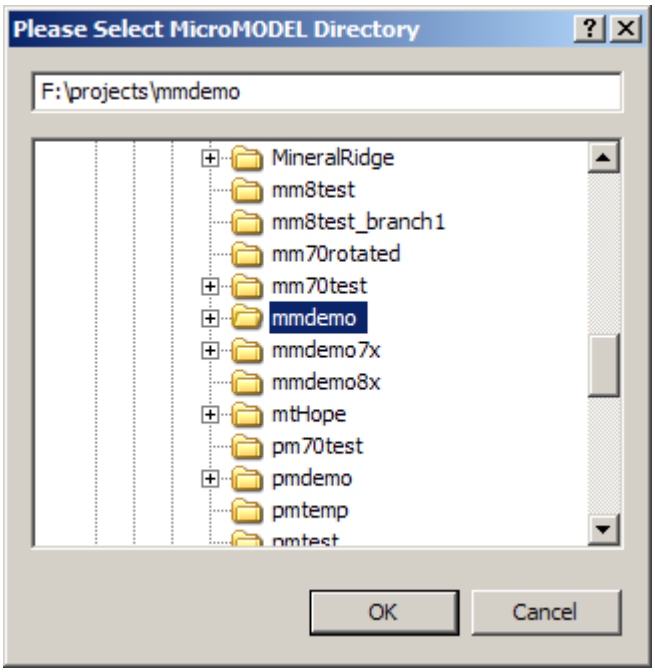
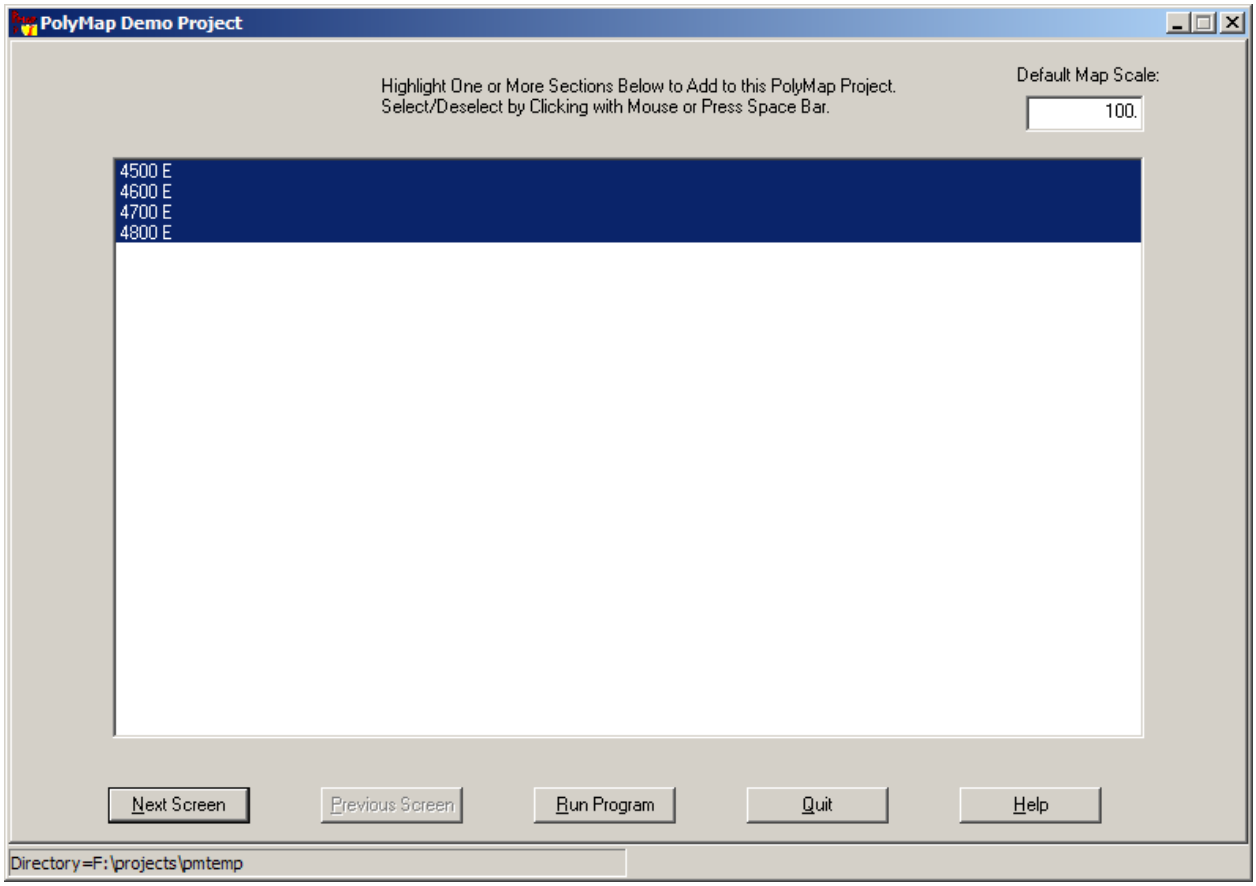


Figure 7 Select the MicroMODEL Directory



1) Highlight all the sections by clicking on the names. Run program.

Here is a listing of the four sections that were added. Note that each was automatically defined as a N-S section looking West.

```
PolyMap Geologic Modeling Software  -  Version 4.00
Project: PolyMap Demo Project

 Map#      Map Name                                                Map Type

  67 4500 E . . . . . . . . . . . . . . . . . . . . . . . . . . . N/S-W
  68 4600 E . . . . . . . . . . . . . . . . . . . . . . . . . . . N/S-W
  69 4700 E . . . . . . . . . . . . . . . . . . . . . . . . . . . N/S-W
  70 4800 E . . . . . . . . . . . . . . . . . . . . . . . . . . . N/S-W
```

Figure 8 List of Four Sections Added from MicroMODEL

1.8. Add a set of Pit Design Maps

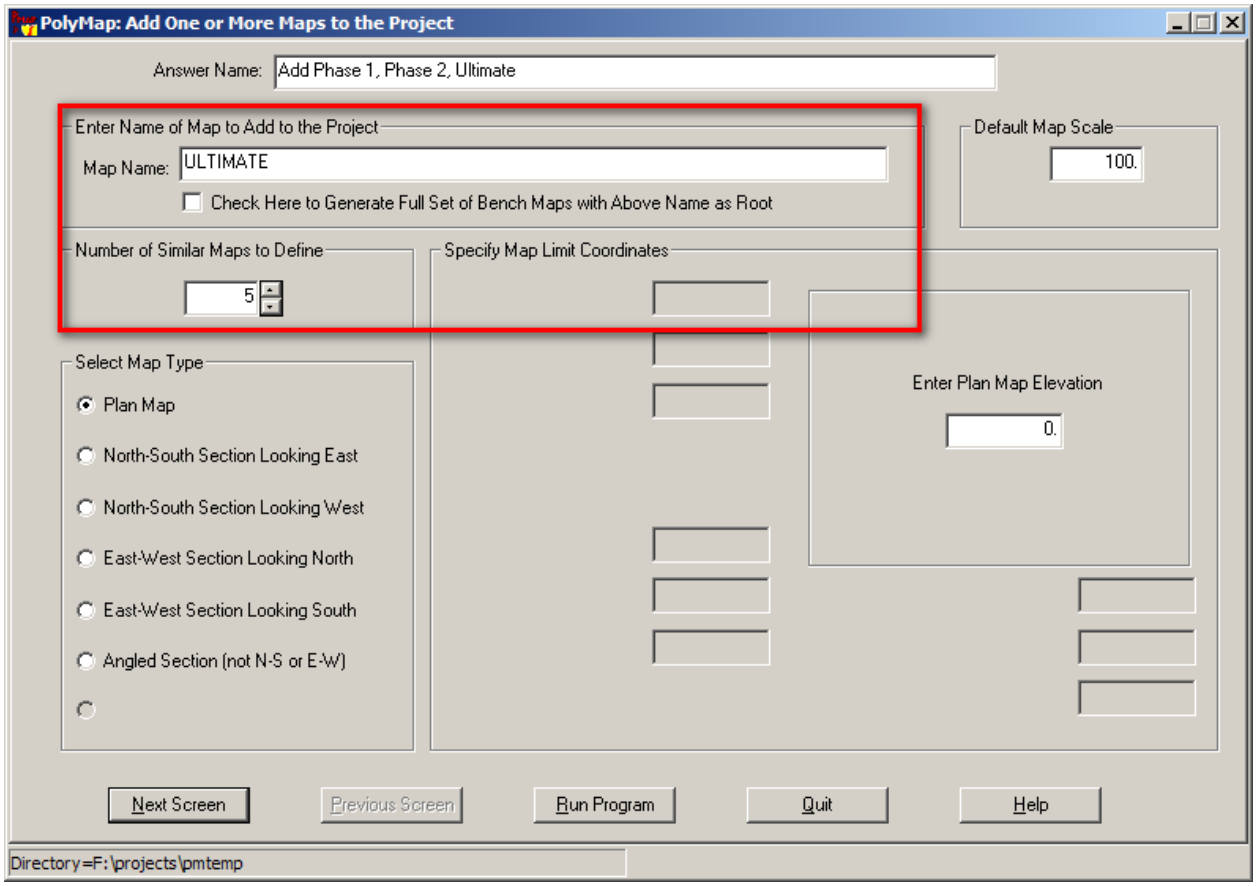


Figure 9 Add Pit Maps Input Screen 1

1) In the first screen, define the first map as the ULTIMATE pit. Add 5 similar maps. We are defining both a map for the pit design map and an additional map for storing the meshed output. (Meshing will be explained later).

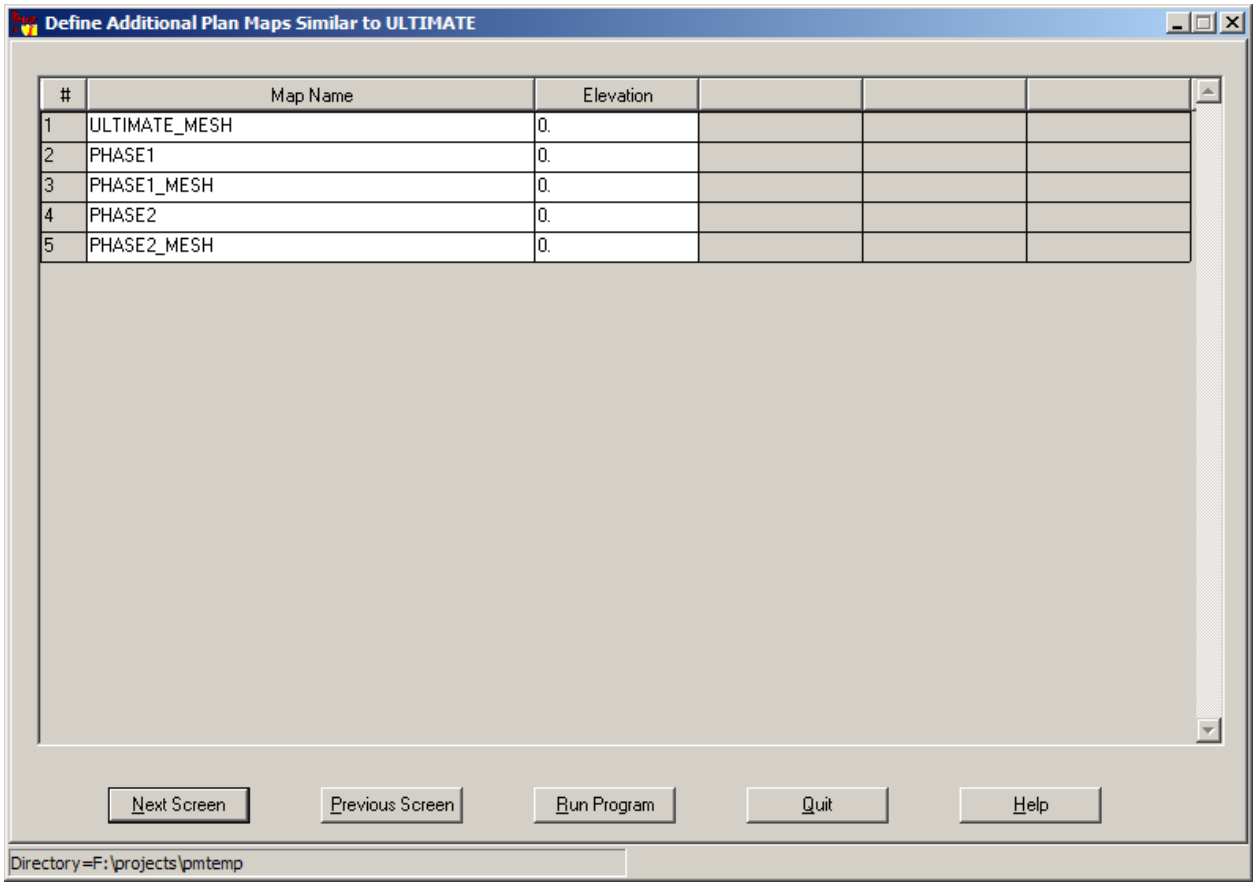


Figure 10 Add Pit Maps Input Screen 2

1) Enter the names of the remaining five maps in the second screen. Leave the elevation at zero, indicating these are topography or pit contour maps.

```
PolyMap Geologic Modeling Software  -  Version 4.00
Project: PolyMap Demo Project

Map#      Map Name                                                Map Type

 73 PHASE1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . Plan
 74 PHASE1_MESH. . . . . . . . . . . . . . . . . . . . . . . . . . Plan
 75 PHASE2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . Plan
 76 PHASE2_MESH. . . . . . . . . . . . . . . . . . . . . . . . . . Plan
 71 ULTIMATE . . . . . . . . . . . . . . . . . . . . . . . . . . . . Plan
 72 ULTIMATE_MESH. . . . . . . . . . . . . . . . . . . . . . . . . . Plan
```

Figure 11 Pit Maps Listing

1.9. Add Bench Mid-Level Elevation Map

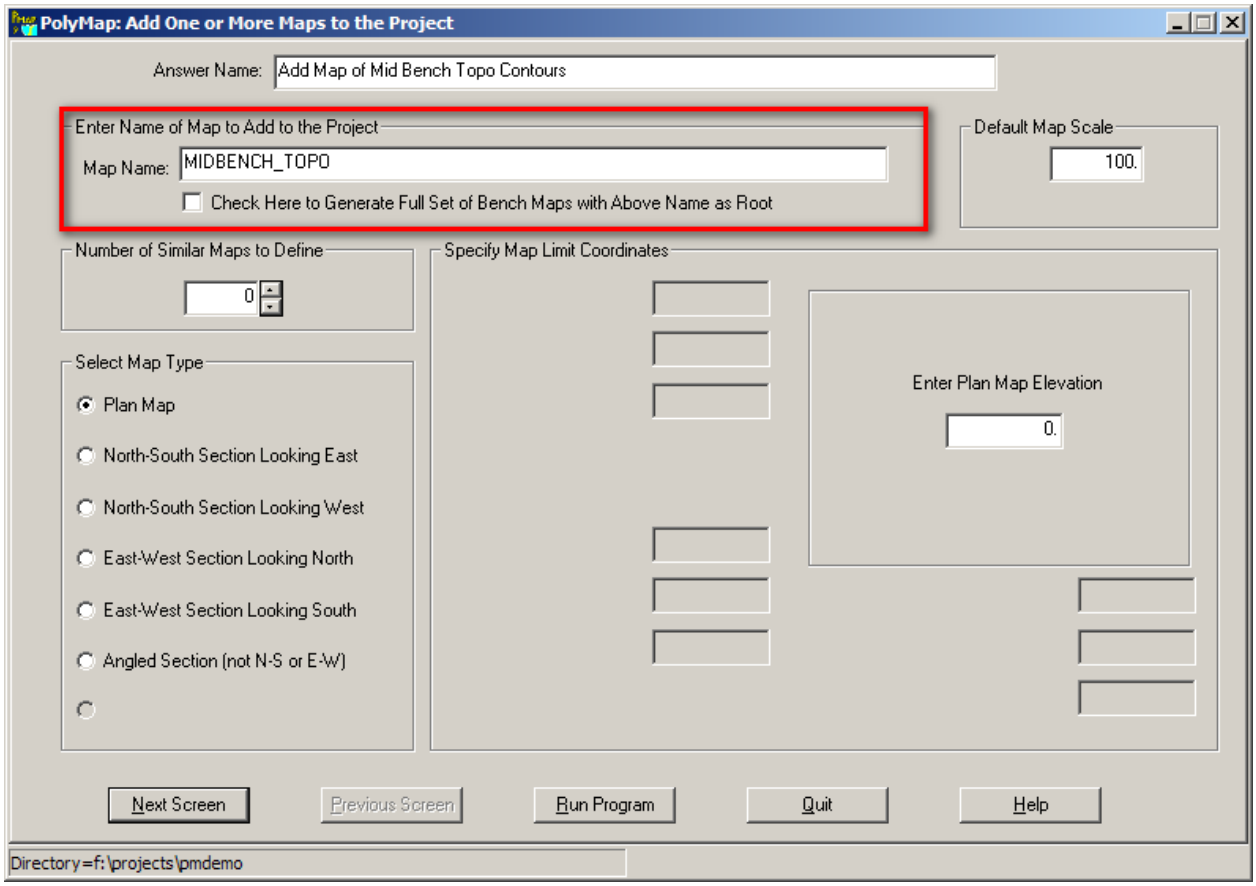


Figure 12 Add Map for Mid Bench Contours

1) Add a map to the PolyMap project where the mid-bench contours can be stored.

1) Import Information to a Map

1.10. Add Topo Contours from DXF to map TOPOGRAPHY

From the Import/Export Menu, Choose IMPORT Map Information from DXF.

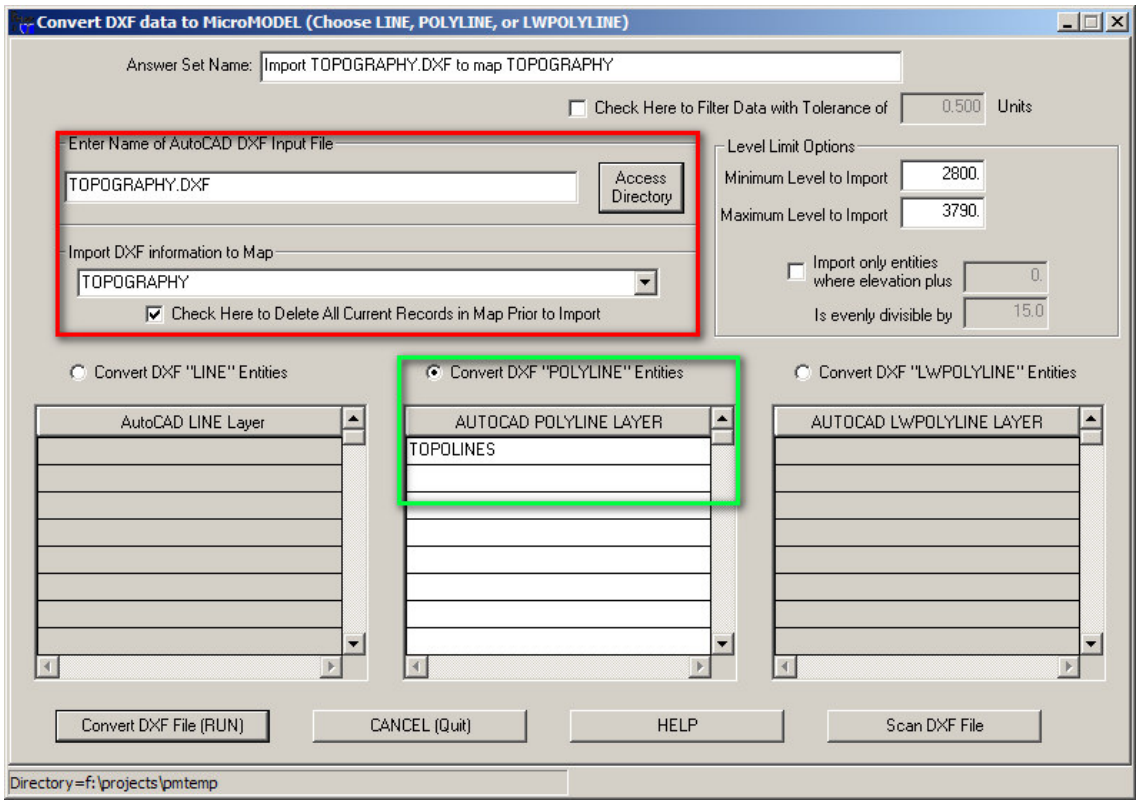


Figure 13 Import DXF information Dialog

1) Choose the DXF file to import. You may enter the file name directly, or use the Access Directory button. Choose the map to import the information to, and check the box to delete all current records. (**Red**)
2) Choose the line type to convert, and which layer(s) to convert. You may click on the Scan DXF File button to determine this information.(green)
3) Click on Convert DXF File (RUN)
4) It is a good idea to review the printout that is generated by the conversion program.

1.11. Display Imported Topography

After importing the topography from the DXF file, we can display the contour lines using Map Display > Plot Raw Geology, Pit Designs, or Topo Maps.

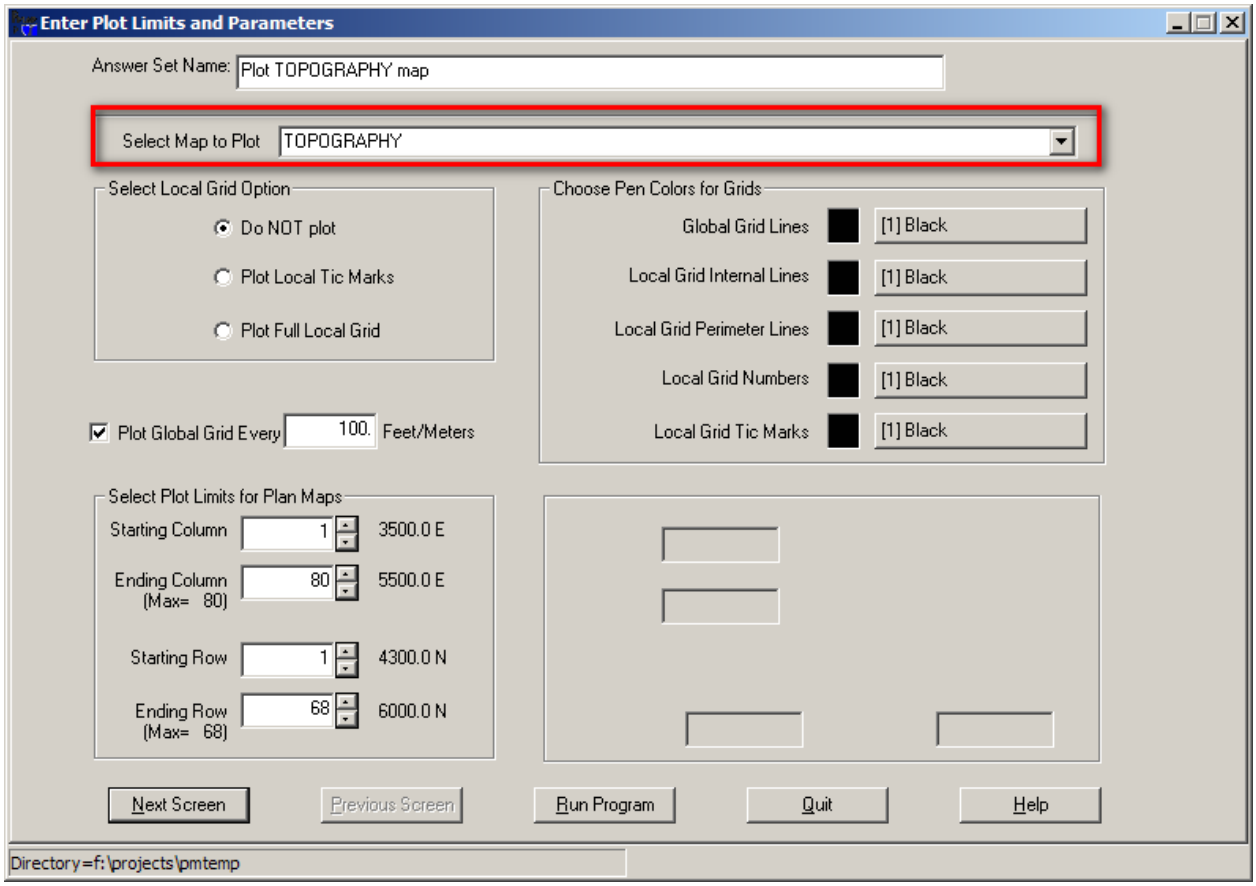


Figure 14 Display Raw Topography Data Input Screen 1

1) Select Map to Plot - TOPOGRAPHY (**Red**)
2) Leave all other items as shown.
   - **[Next Window]**

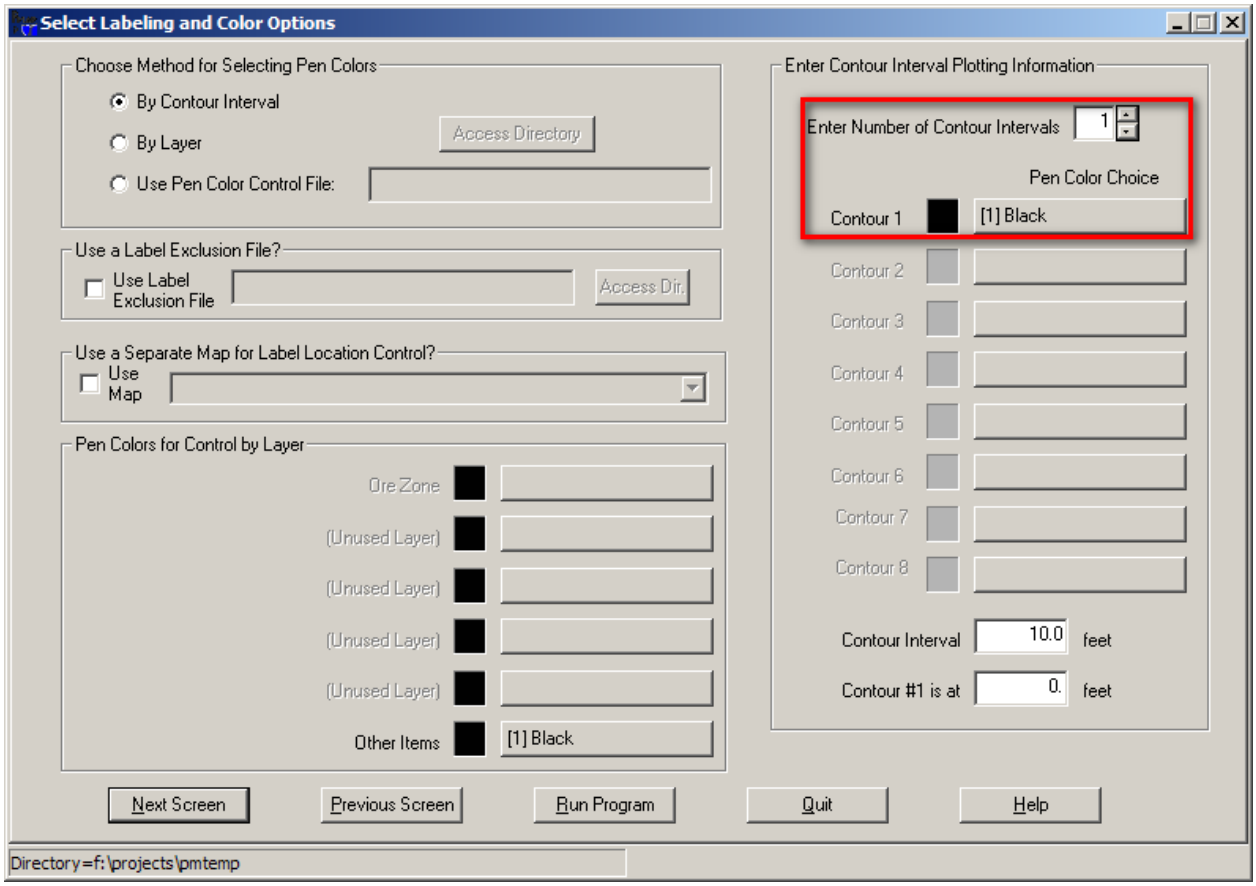


Figure 15 Display Raw Topography Data Input Screen 2

1) Enter Number of Contour Intervals – 1. Make all contours the same color - black(**Red**)

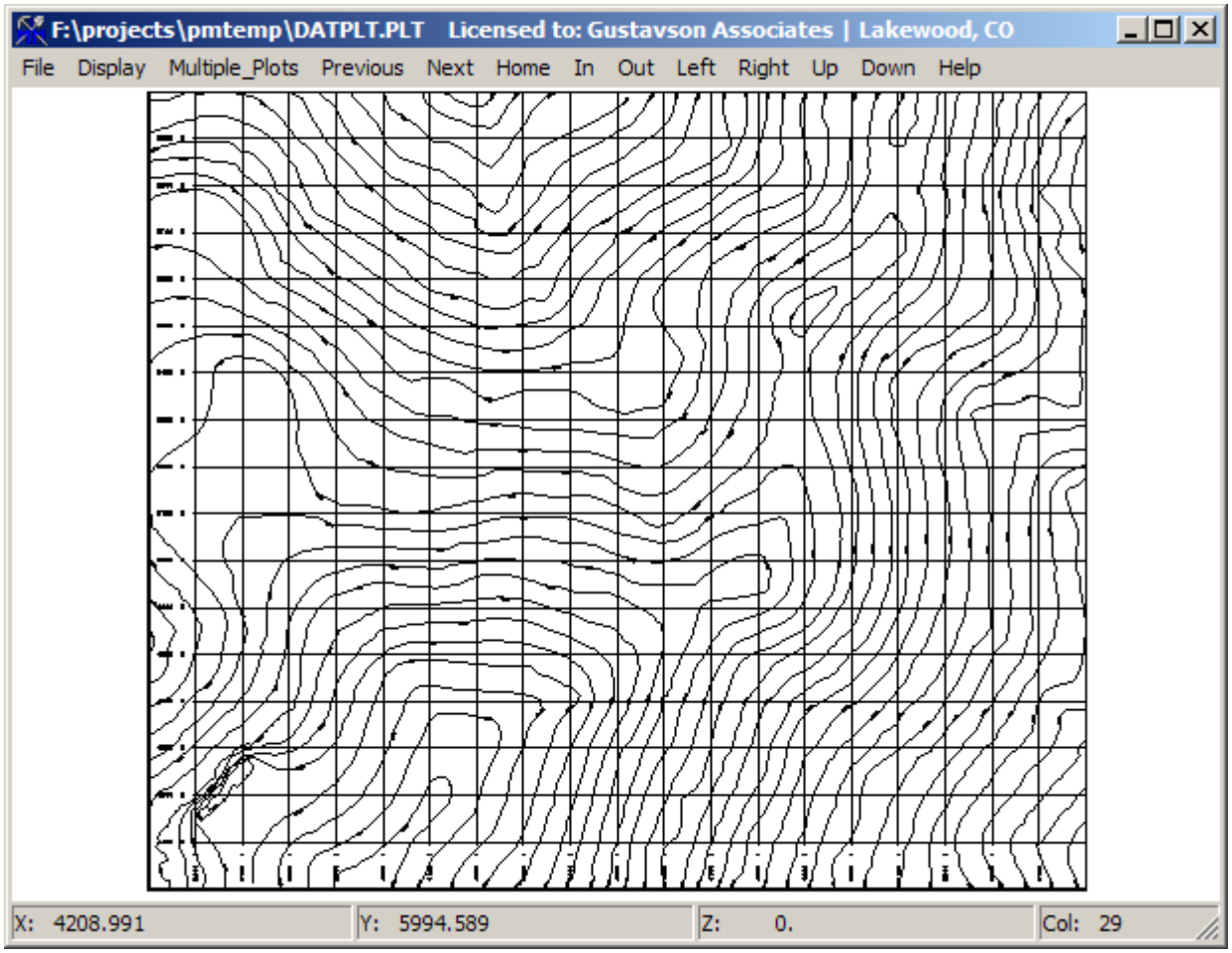


Figure 16 Plot of Imported Topography

1.12. Add Bench Mid-Level Elevation Map

After adding the map to the project, import contours from the associated MicroMODEL project starting topography grid. Use the PolyMap > Export Cone Contours to Polymap map program:

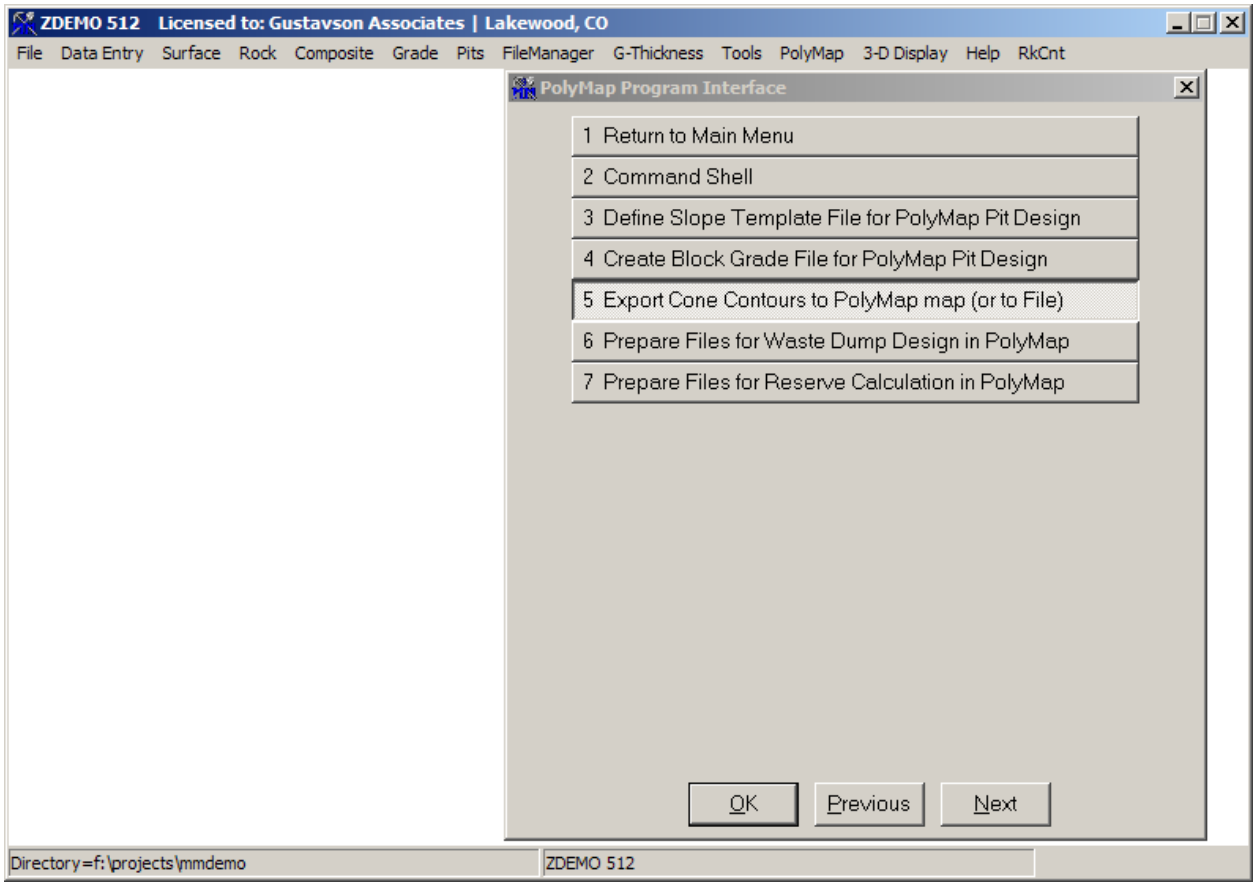


Figure 17 Export Contours to PolyMap Program

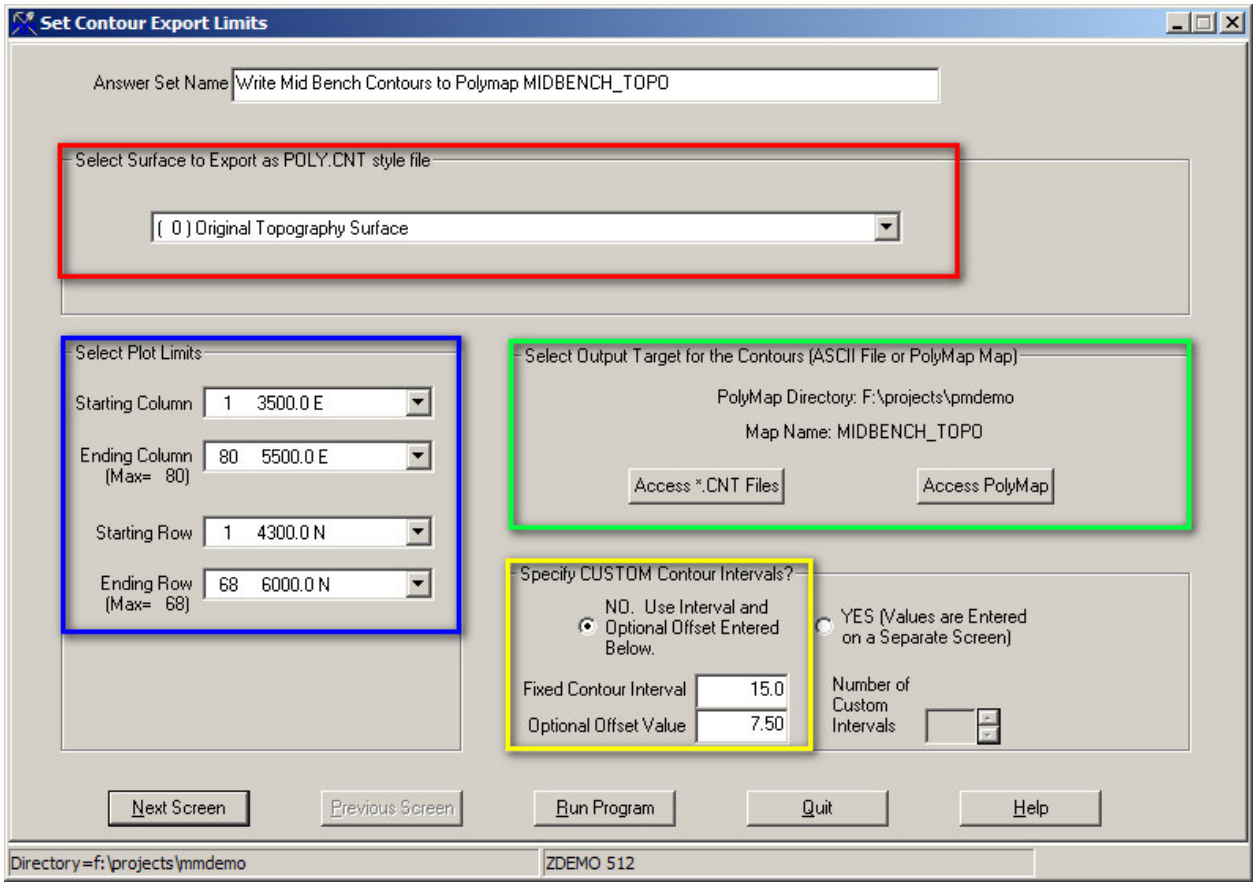


Figure 18 Export Contours Input Screen

1) Select the surface grid to export. In this case, we are exporting the original topography surface, T200.(red)
2) Export contours for the entire project area.(blue)
3) Use the Access PolyMap button and select map name MIDBENCH_TOPO. The contours will be written directly to the map that we just create in PolyMap.(green)
4) We want to export bench mid-point contours, so we select a fixed interval of 15 feet, with an offset of 7.5 feet.(yellow)

Check the MIDBENCH_TOPO map by displaying it from PolyMap. Use the same settings that were used to display the imported Topography in the previous section.

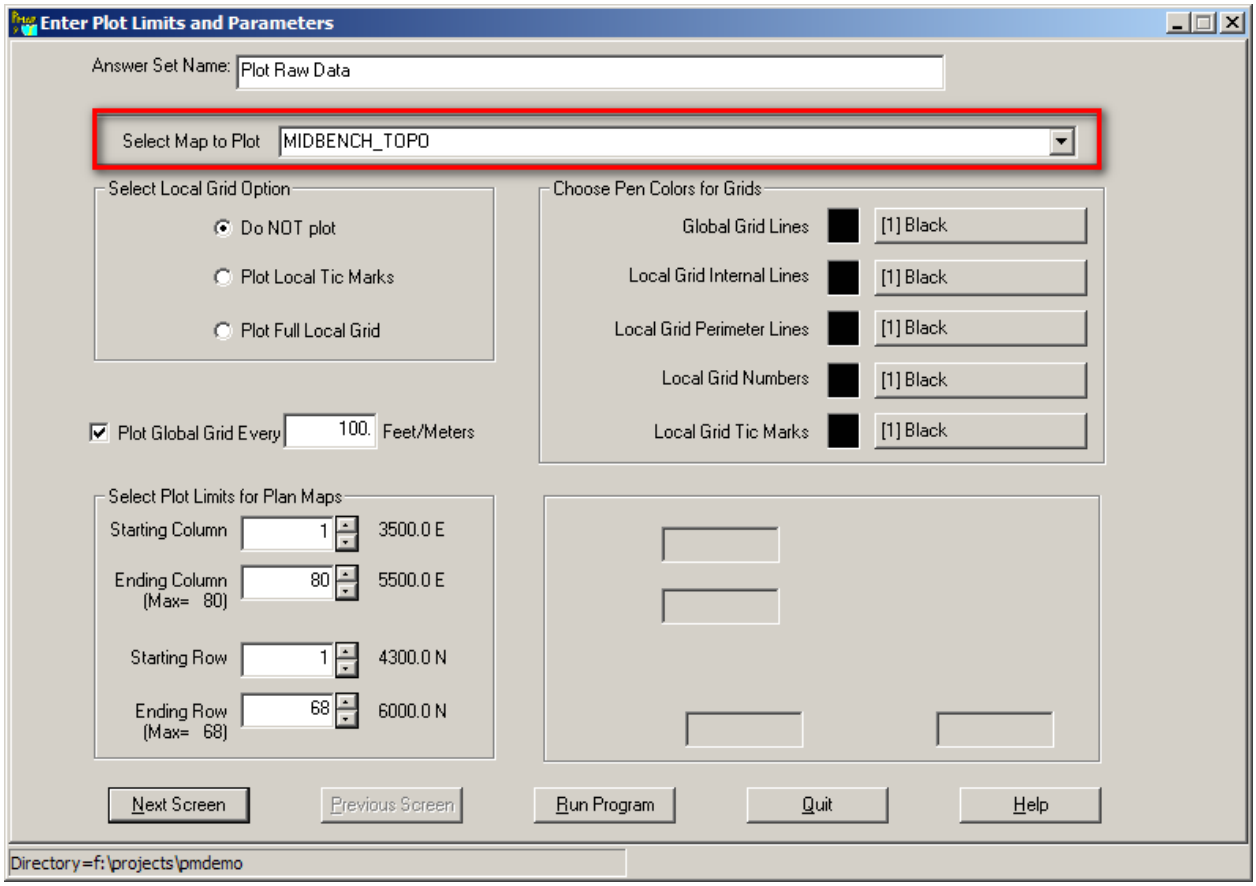


Figure 19 Display Mid Bench Topo Input Screen

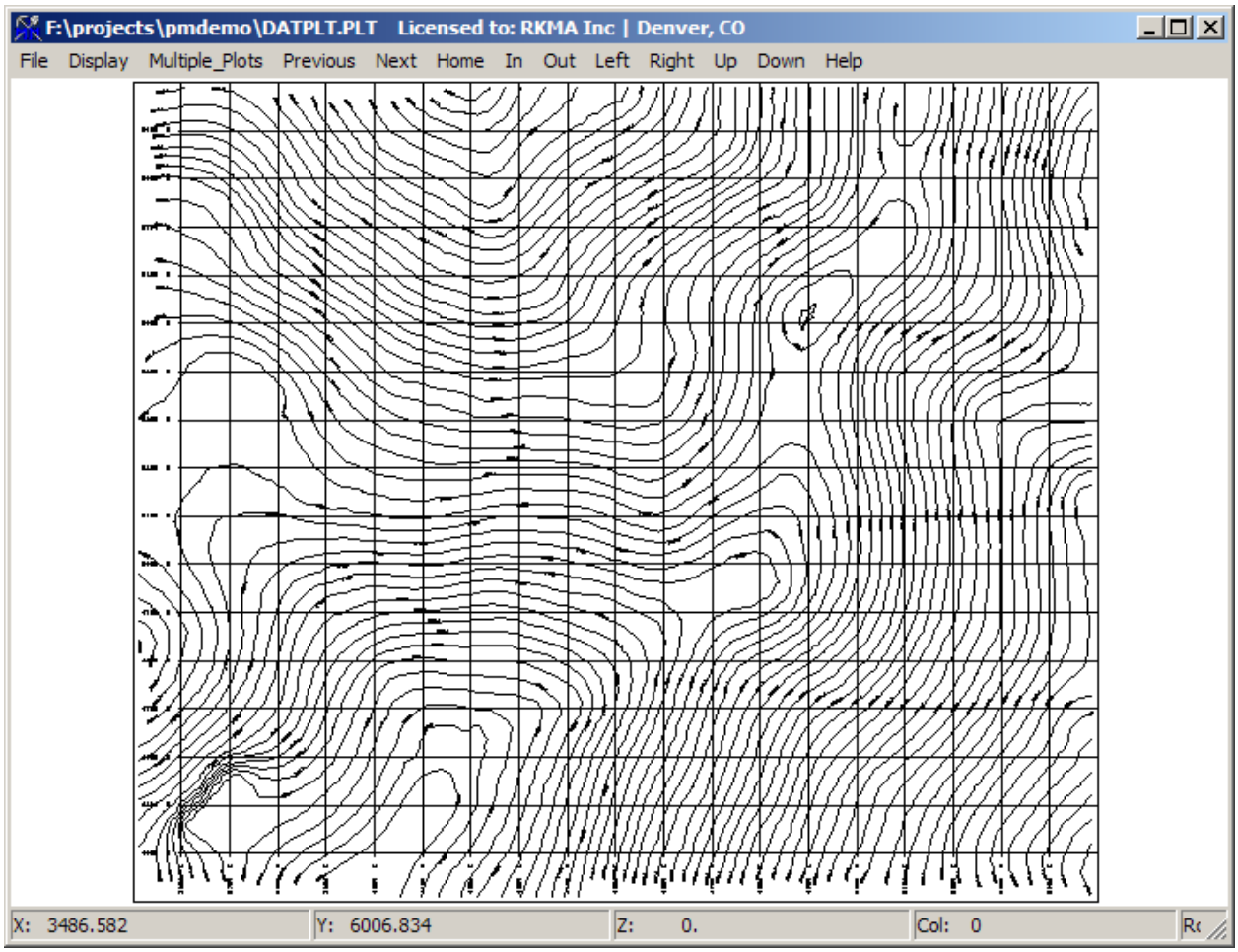


Figure 20 Display of Imported Mid Bench Contours

1.13. Check Map for Correct Direction

Topo lines that are used by PolyMap should be entered such that uphill is to the left and downhill is to the right as the line is traversed from start to finish. Another way to explain it is that you enter the points in a clockwise direction around holes (pits) and in a counter-clockwise direction around hills. Because of this requirement, there is a checking program in the Map Data Entry menu that can be used to automatically "flip" the direction of topolines so that they adhere to the convention. The mid bench contours that were just imported to Polymap should be checked with this tool.

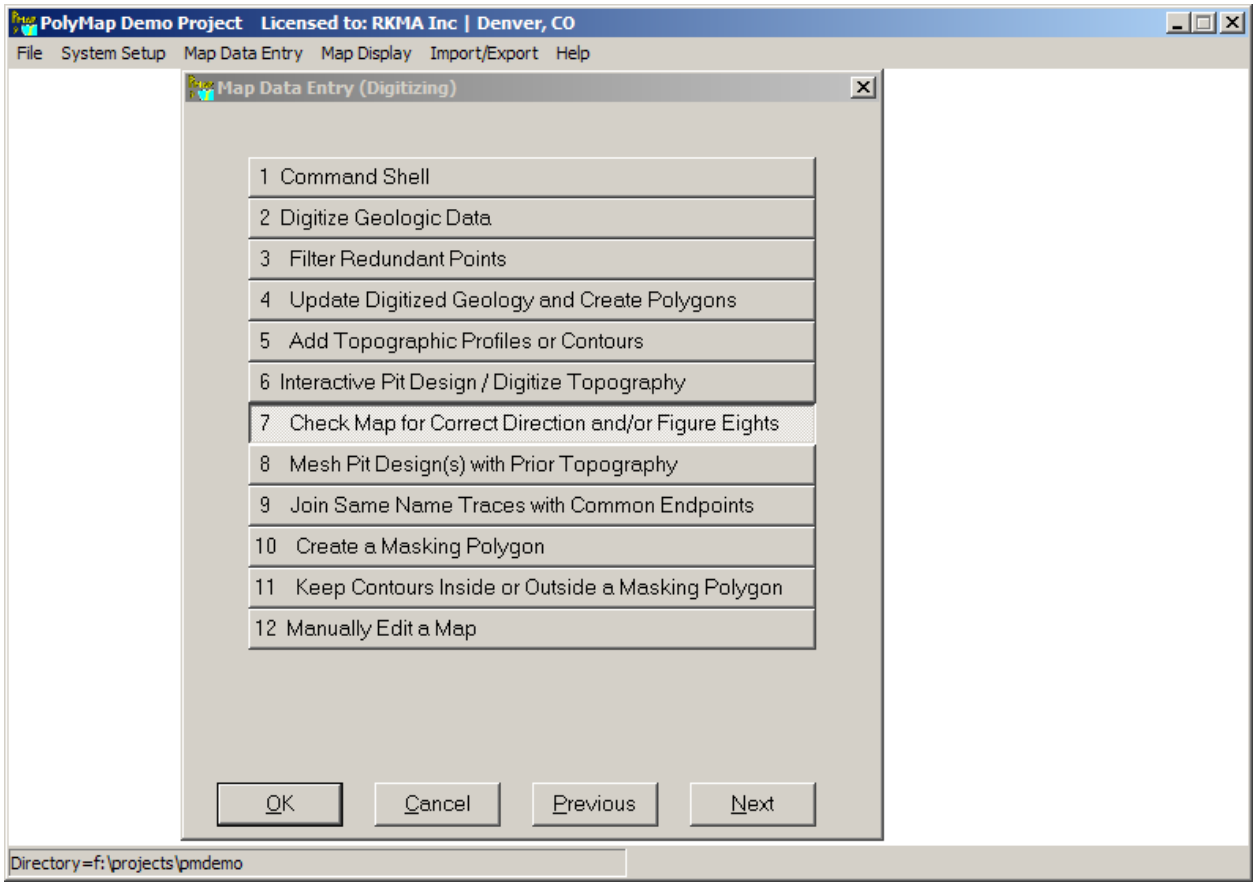


Figure 21 Start the Check Map for Correct Direction Program

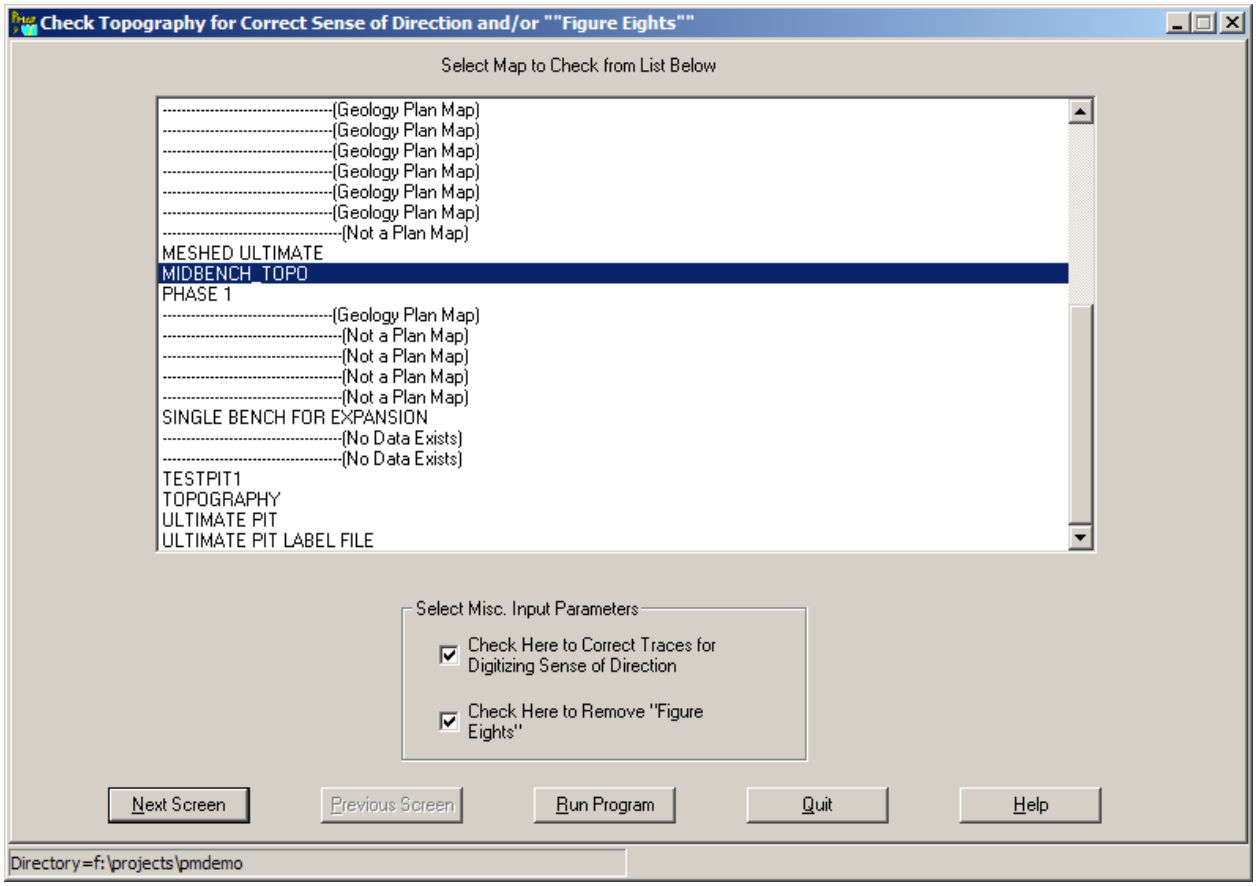


Figure 22 Check Map for Correct Direction Input Screen

1) Select the map to check (MIDBENCH_TOPO) and check both boxes. The program will correct the trace directions and also remove any “figure eights” in the lines. In some cases, there will be one or more topo traces whose direction cannot be automatically resolved. For our MIDBENCH_TOPO map, there are two such traces, as shown in the check program printout:

```
PolyMap Geologic Modeling Software  -  Version 9.00
Project: PolyMap Demo Project

 *** Check Sense of Direction and Figure Eights Summary ***
 Checking Map MIDBENCH_TOPO
 Number of elevation traces read =          80
ERROR:  Trace at elevation =         3332.50 is between
        two other traces that are either above or
        below this trace.  Record number of this
        trace is    47
        Easting/Northing =      3512.50     4842.56

Flipping trace 3347.5           record #    50
Flipping trace 3362.5           record #    53
.
.
.
Flipping trace 3032.5           record #     4
Flipping trace 3182.5           record #    24


The direction for the following traces could
not be determined by CHKTOP.  You must manually
check these traces:

 record#   elevation   min. east   max. east   min. north  max. north

    60       3392.5       5077.       5152.       5868.       5988.
```

Figure 23 Check Direction Printout Showing Two Unresolved Traces

These unresolved traces should be checked and fixed. The interactive pit design program is explained in detail in another section. It is used to find these two traces and flip their direction. The following screen shots show the two traces before any fixes were applied. Only the first trace needed to be flipped. By convention, topoline elevations in the interactive design program have their elevation labels plotted such that if the user “stands” in front of the label where he can “read” the label, the user is facing uphill.

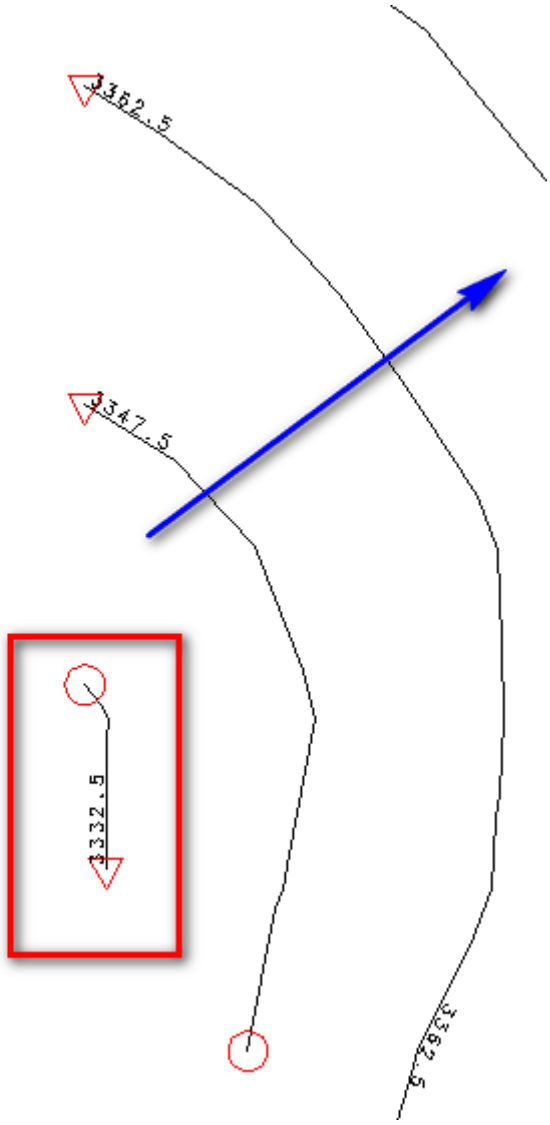


Figure 24 Wrong Direction Contour 3332.5

1) We can see from the above figure that the 3347.5 and 3362.5 traces are entered in the correct format with the blue arrow pointing uphill. The 3332.6 trace must be flipped using the FLIP command.

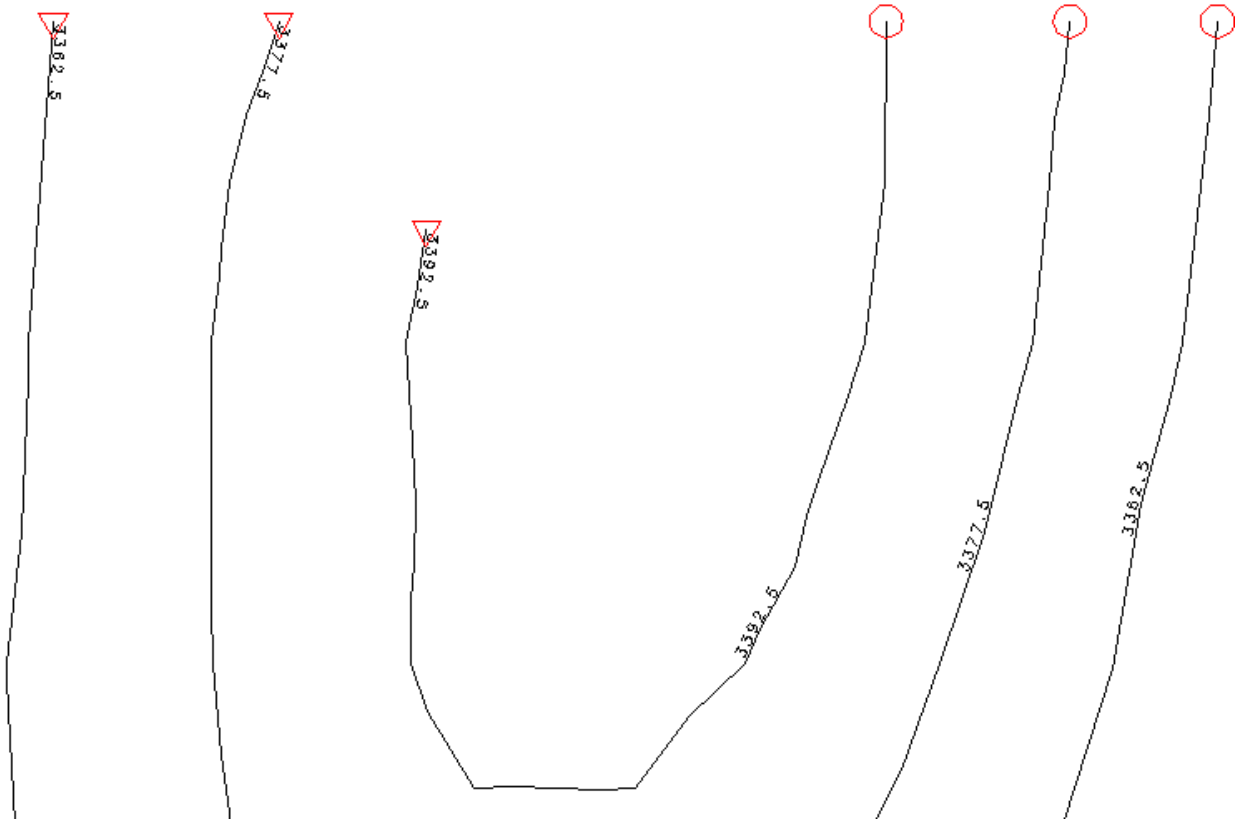


Figure 25 Second Unresolved Trace. Direction is OK.

1) The second unresolved trace is actually OK. See the 3392.5 elevation trace in the figure above. In some cases, the checking routine can't confirm if a trace direction is OK, based on surrounding traces. We leave this one "as is."

2) Ultimate Pit Design Example

The PolyMap program can be used to design ultimate pits. Pit slopes can be a simple single slope, or the user may define a 3-D slope template file. The slope template file allows for multiple benching, if desired. For our example, we will design a simple pit at 45 degrees slope, and a road width of 80 feet. We already created a map called ULTIMATE PIT where we will create our pit design.

As a guide, we will use contours from the cone pit that was generated with MicroMODEL. We will store those contours in a separate new map, called CONE_CONTOURS. We will also create a background display of grade blocks, which are color coded by our inverse distance gold model.

1.14. Create Map for Cone Contours

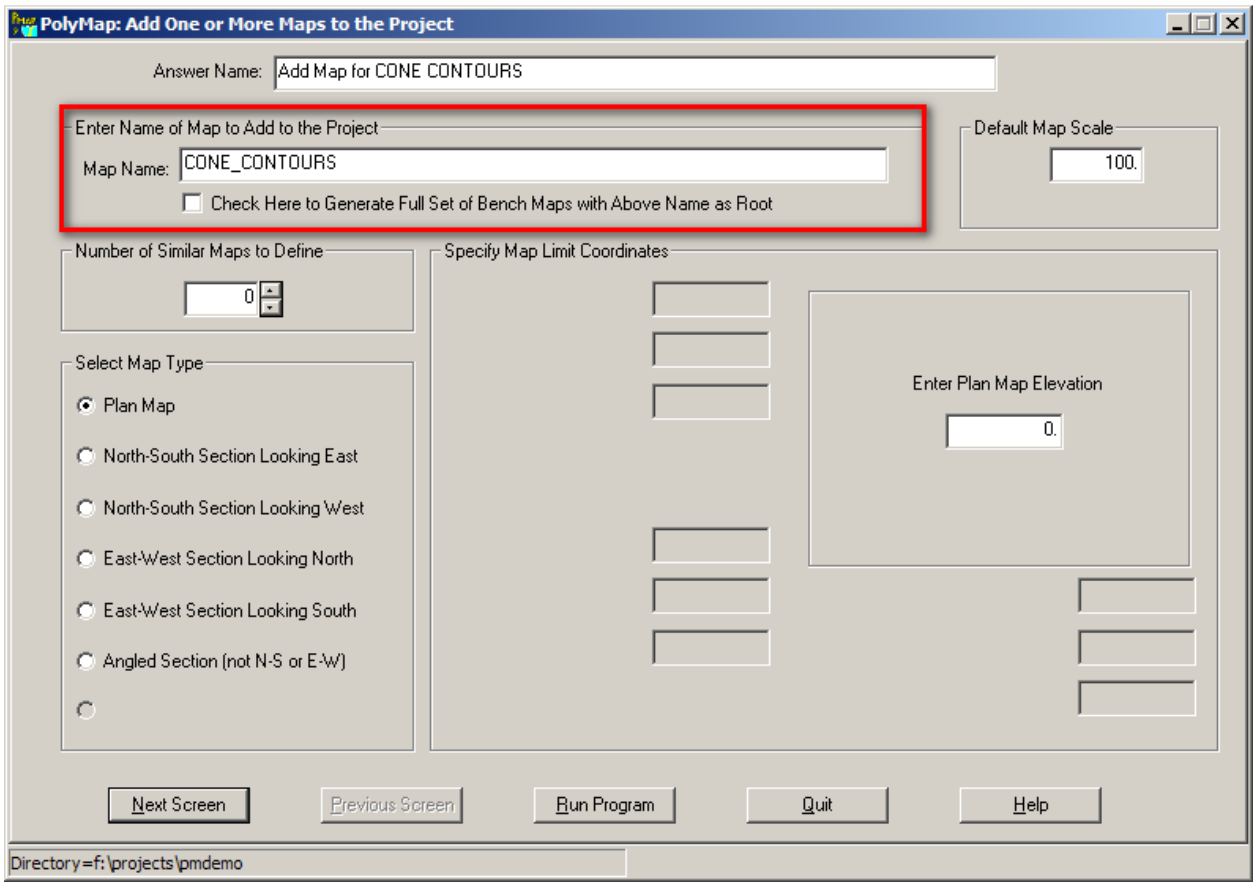


Figure 26 Add a map called CONE_CONTOURS

1) Add a single new map to our PolyMap project called CONE_CONTOURS.(red)
2) From MicroMODEL, choose PolyMap choice Export Cone Contours to PolyMap map.

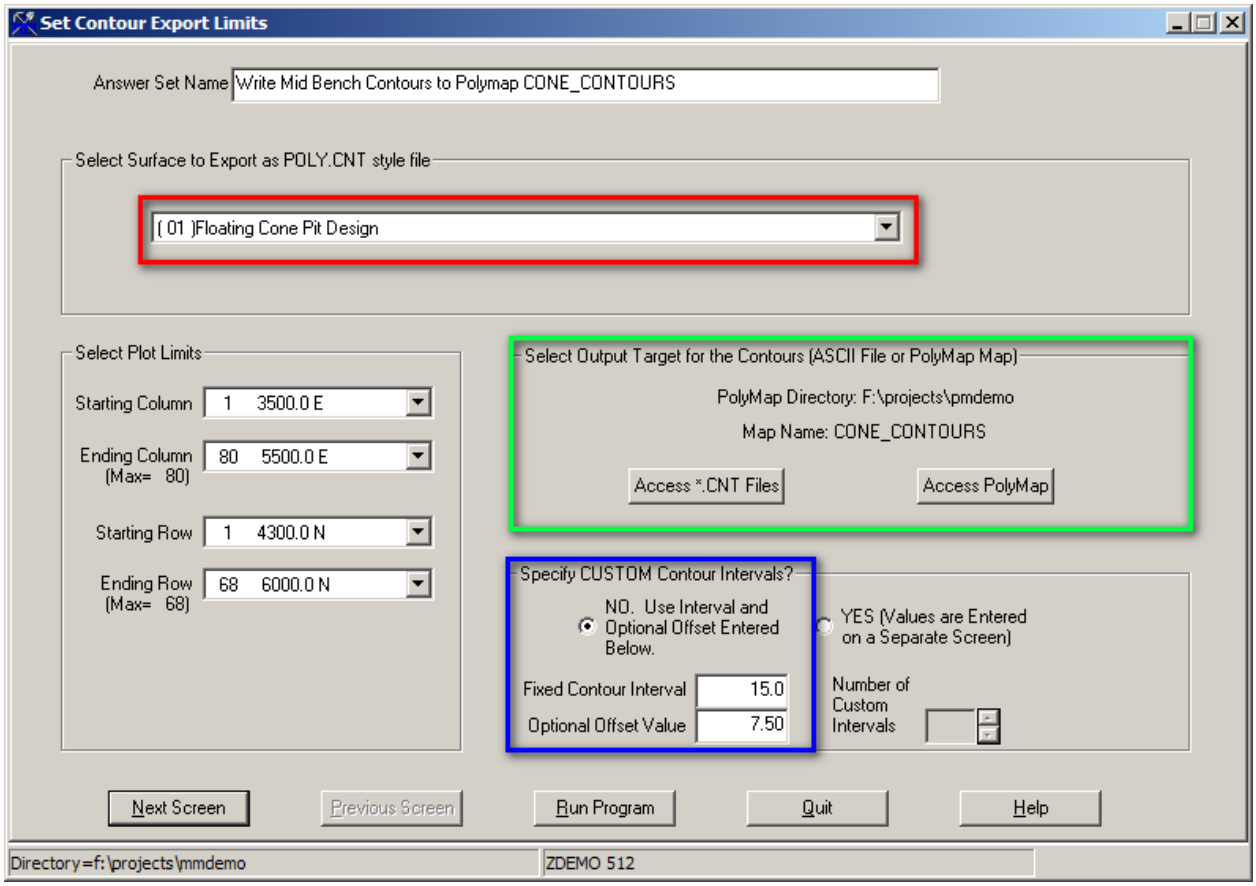


Figure 27 Export Floating Cone Contours to PolyMap

1) Select the cone surface that was created for the MicroMODEL demo.(red)
2) Select the target, which is map CONE_CONTOURS in our PolyMap demo project.(green)
3) Be sure to export bench midlines, as we will be designing on bench mids.(blue)
4) Run the check topo for proper direction on the CONE_CONTOURS map after export is completed.

1.15. Create Background Display Bench Maps of Gold Grade

In addition to the floating cone contours, we also create a background display file showing gold grades by bench. These grade blocks act as another guide to our ultimate design. In Grade Modeling, Graphical Display of Grade Model, select Plan View Cell Plot of Grid Values.

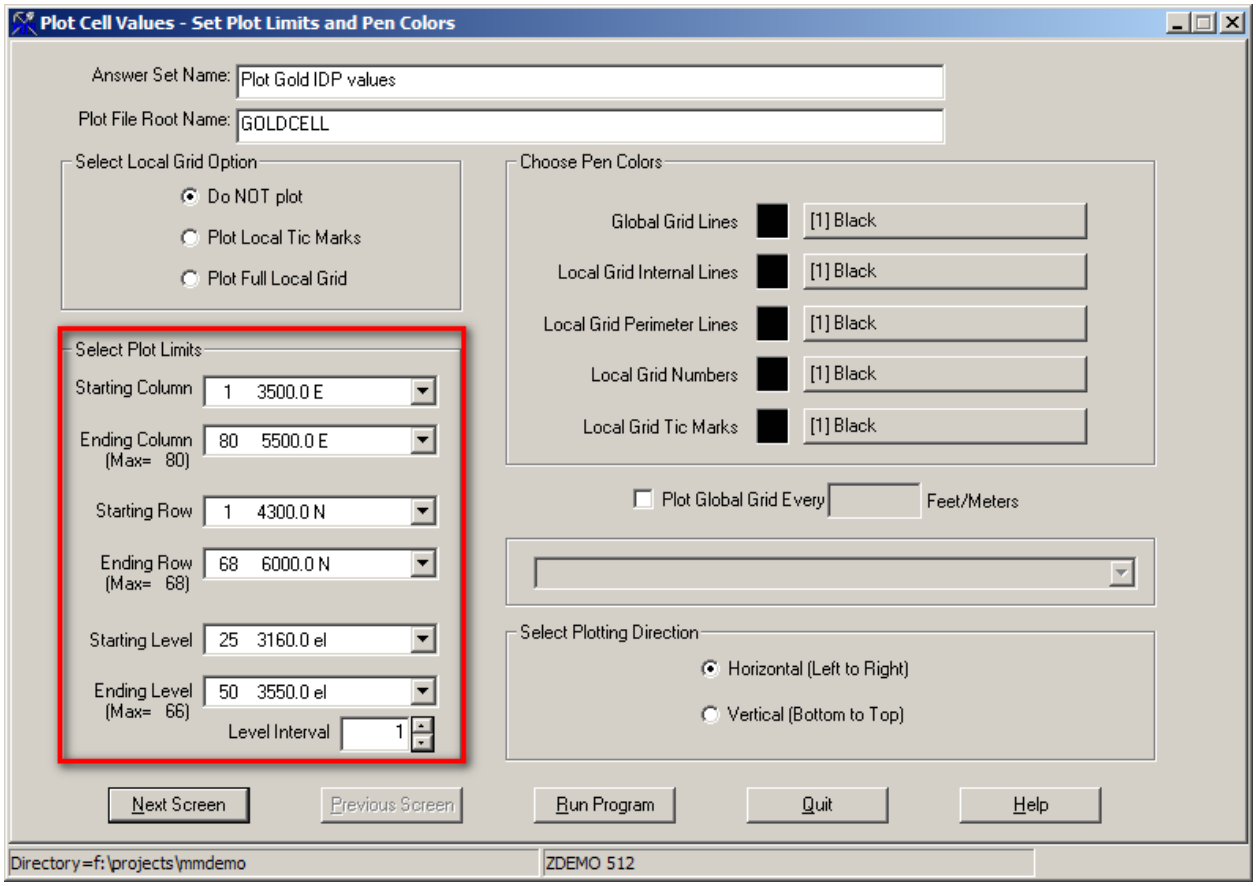


Figure 28 Create Gold Cell Plot Input 1

1) Display the entire extent of the model in plan. Select a subset of levels (benches) from 25 to 50 and set the interval to 1.(red)
2) Be sure to leave the local grid as do NOT plot, and leave the Plot Global Grid unchecked. The name of the plot file will be GOLDCELL.

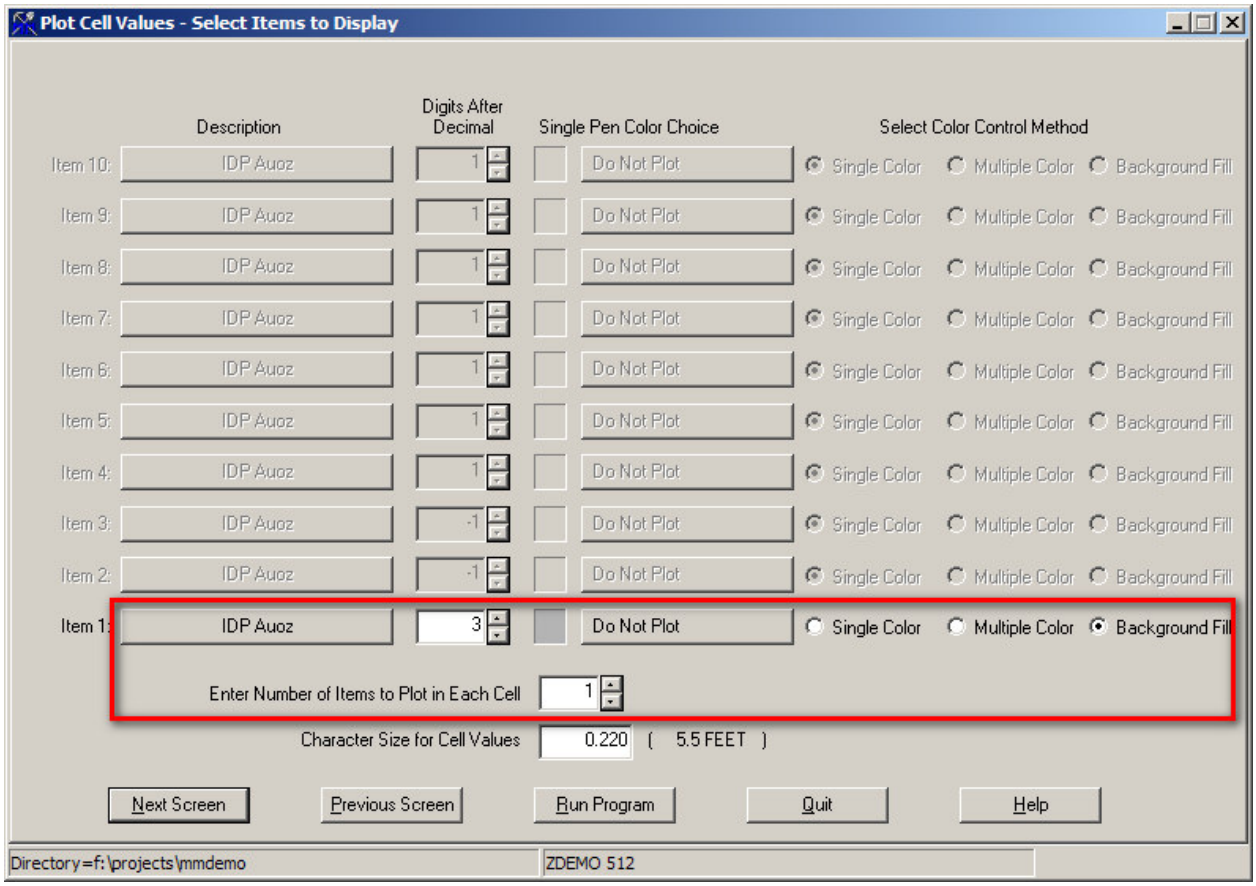


Figure 29 Create Gold Cell Plot Input 2

1) Select model IDP Auoz. Note that the label color option is set to “Do Not Plot.” Background Color fill is selected.(red)

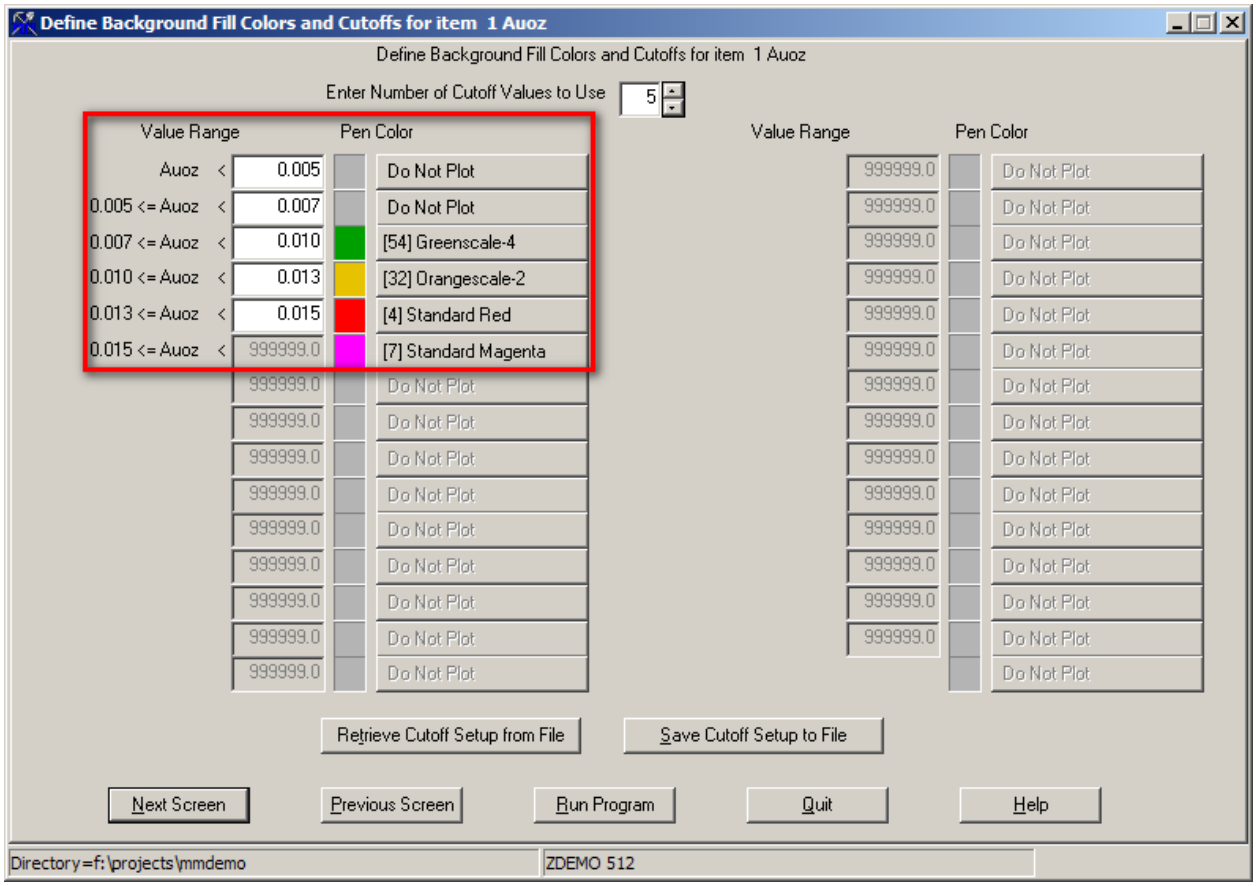


Figure 30 Create Gold Cell Plot Input 3

2) Select a coloring scheme for the gold grades. This scheme does not plot blocks that are below the ROM cutoff of 0.007 opt. ROM material shows in green. Ore material (Au > 0.010 opt) shows in shades ranging from yellow to magenta.(red)

1.16. Start the Pit Design Program in PolyMap

From PolyMap, we choose Interactive Pit Design from the Map Data Entry menu. Choose ULTIMATE PIT as the map to Edit. Leave the digitizing Tablet check boxes unchecked.

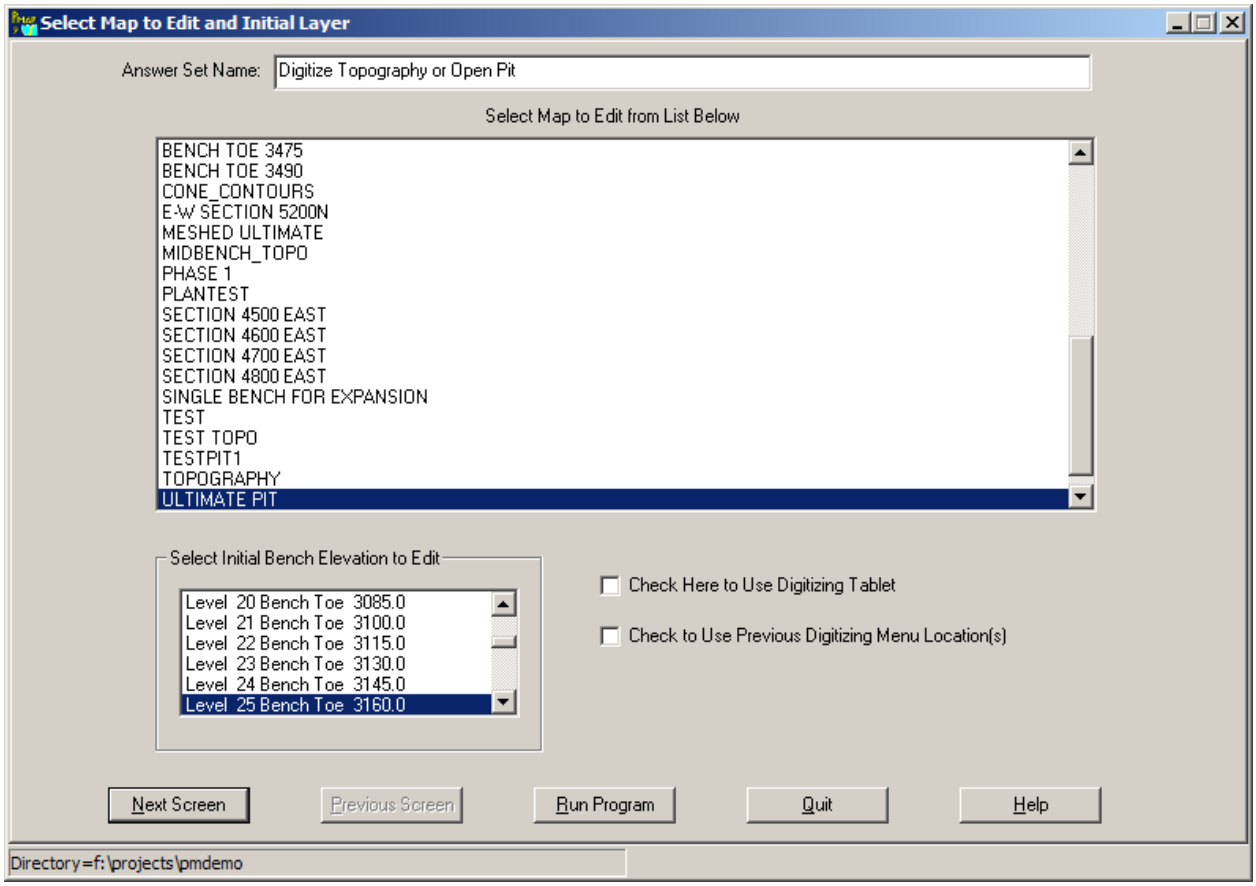


Figure 31 Ultimate Pit Design - Select ULTIMATE PIT map

After choosing Run Program, the user is presented with the Pit Design screen. The screen is maximized, and there is a menu plus a couple of dozen icons along the top. Command information shows in the lower left echo cell. Other cells at the bottom show x,y,z (easting, northing, elevation) as well as block model row, column, level. The following screen shot is a “shrunken” version of the actual screen, and the coordinate echo values do not show.

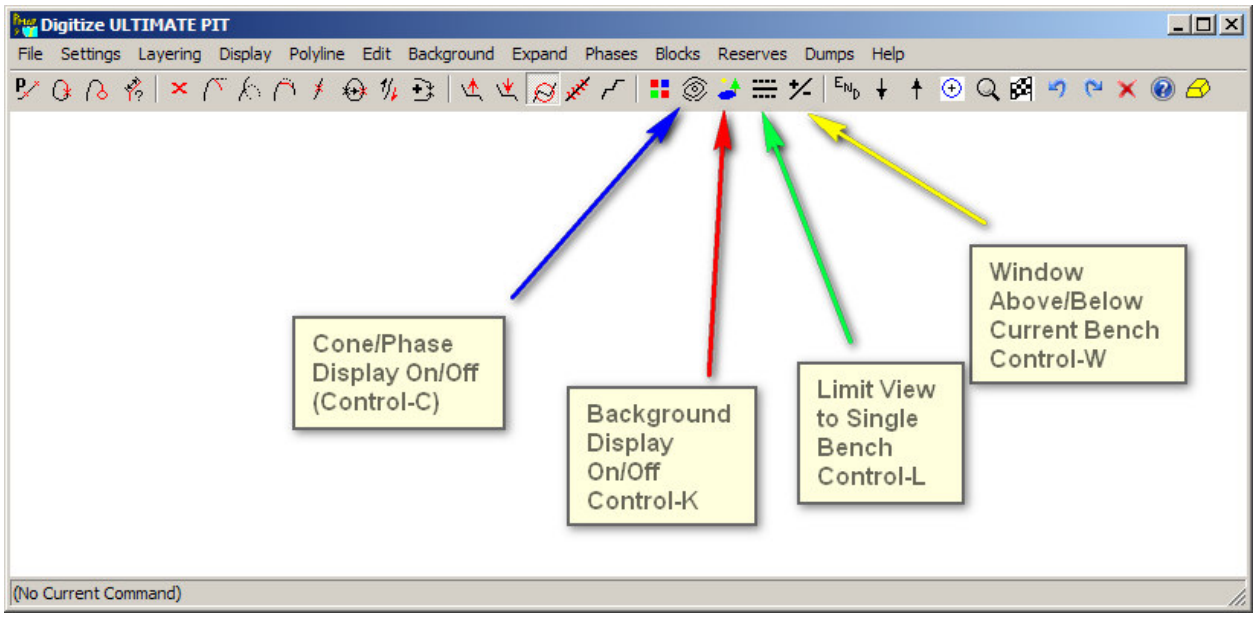


Figure 32 Pit Design Screen

1) The four icons are the most used in controlling what is displayed with the pit design program are pointed out in the above figure.
2) Cone/Phase on/off control will show or hide the phase or phases that have been designated.
3) Background off/on will show or hide our gold grade block fill map.
4) Limit View to Single Bench is used to limit the display to the current bench, or to show all levels of the design at once.
5) Window above/below bench lets you show or not show one or more benches above and one or more benches below the current bench.

1.17. Set the cone pit as a background phase.

1) Click on the Phases Menu, and choose Set Background Phase Display Parameters.
2) Set the values as shown in the following figure.
3) Turn on the phase display by clicking the appropriate icon, or via the shortcut key (control-C)
4) Press the HOME key to zoom the display to map extents.

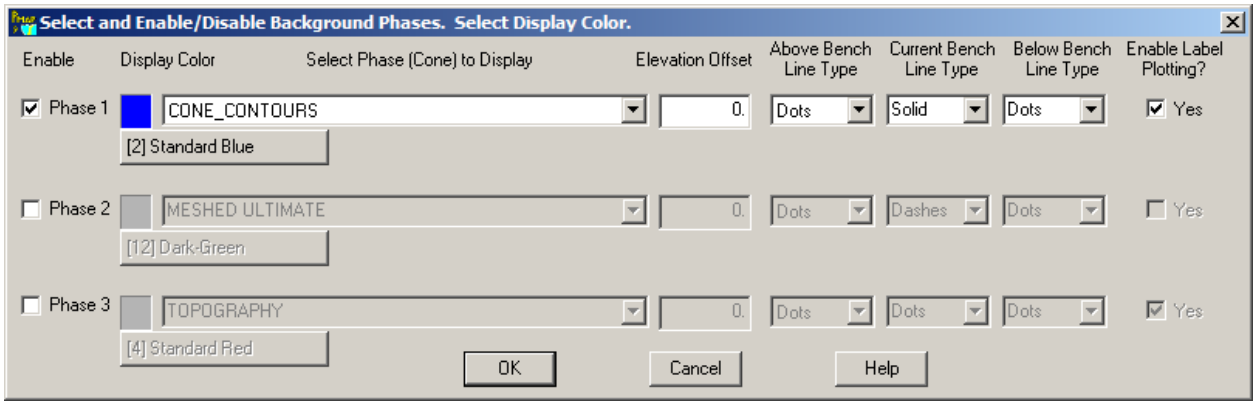


Figure 33 Define Phase 1 as the Cone Contours

Here is a shrunken version of the display screen, showing the cone contours as a background phase.

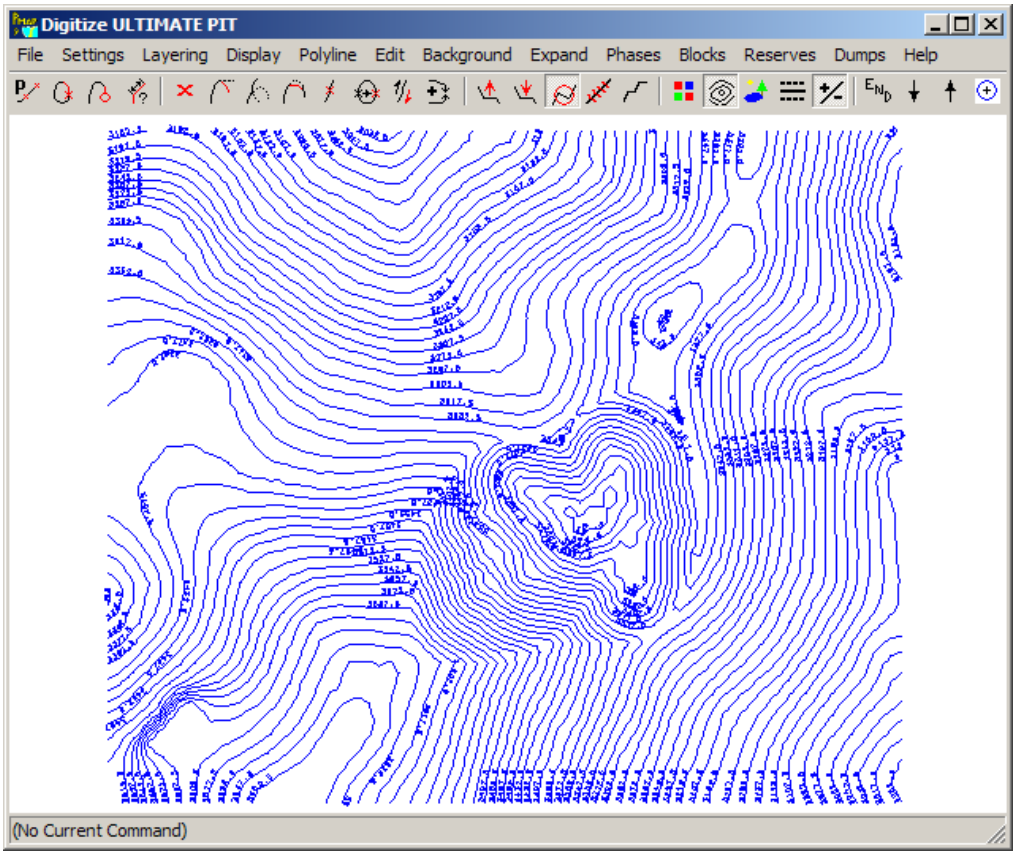


Figure 34 Display of the Cone Contours (Phase 1)

Now, limit the display to a single bench by pressing the single layer/bench icon, or use the shortcut key (control-L). Use either the level up/down icons (black up/down arrows) or the shortcut keys (Numpad+,Numpad-) to change the display to level 28, which is the lowest bench that was “mined” by the coner. Use the zoom/pan controls until you see a view like the following.

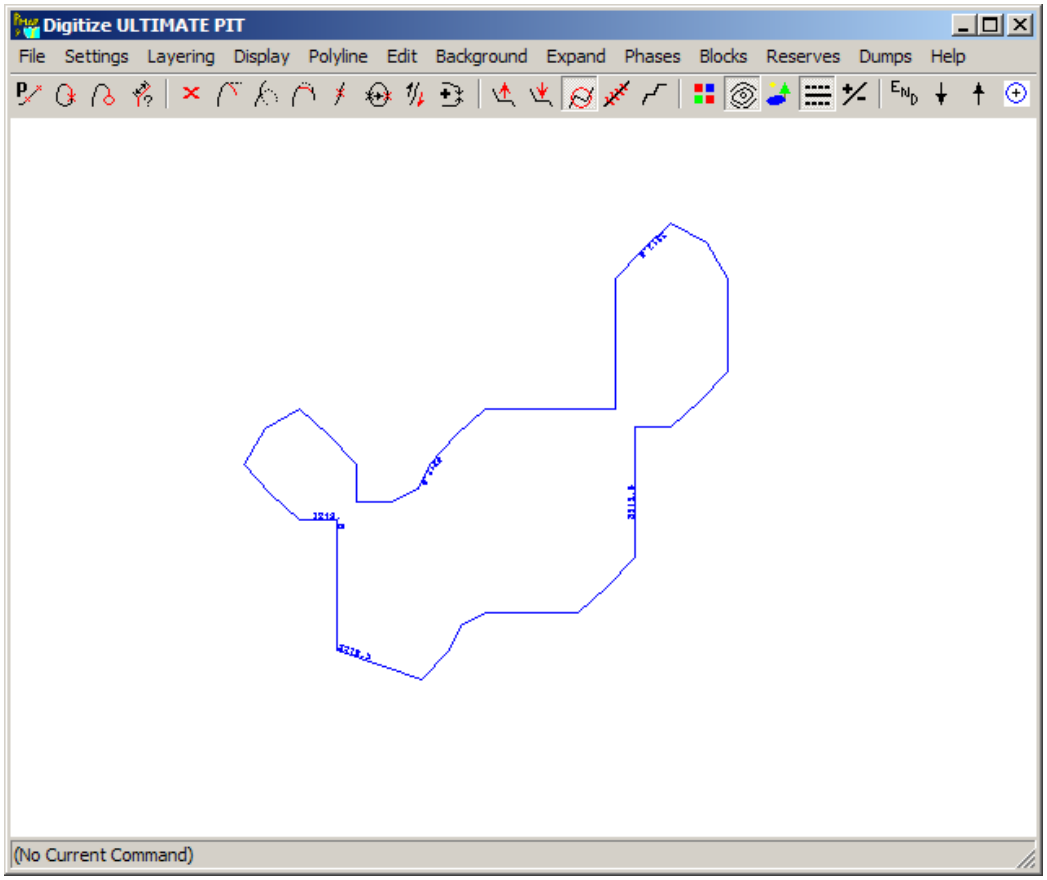


Figure 35 Zoomed In View of Cone Pit Bottom

1.18. Add the plan view cell plot as our background display.

1) From the Background Menu, select Set Background Plot Parameters.
2) Fill in the dialog as shown below. Be sure to check the “Enable Background Plot” checkbox.

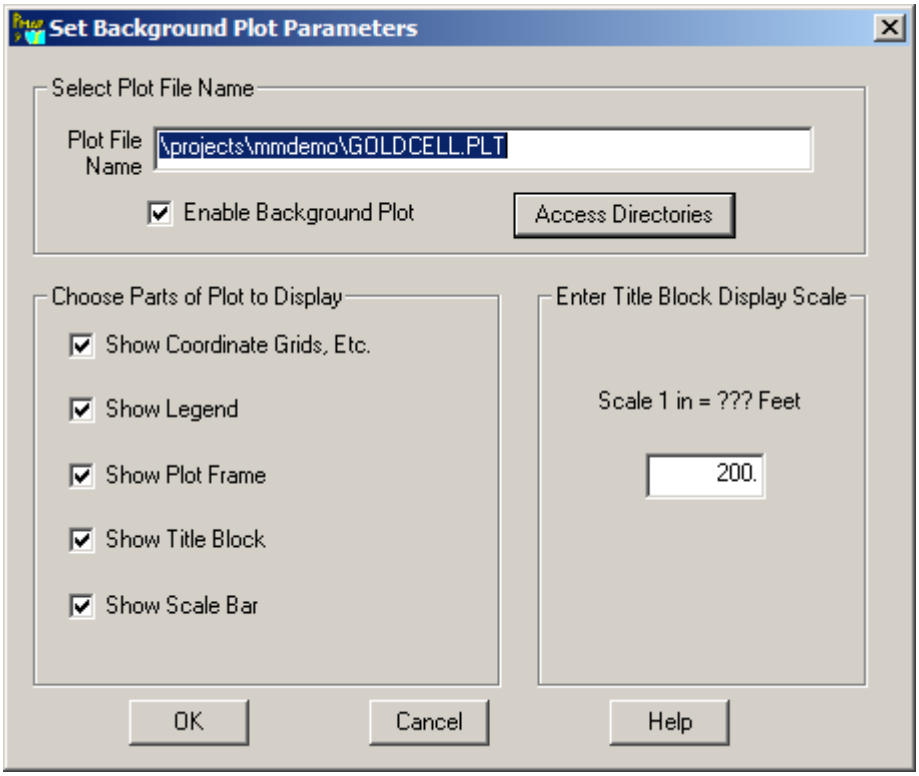


Figure 36 Set the Background Display Parameters

3) Press the Show Background icon, or use the shortcut (control-K)
4) You should see a display similar to the following.

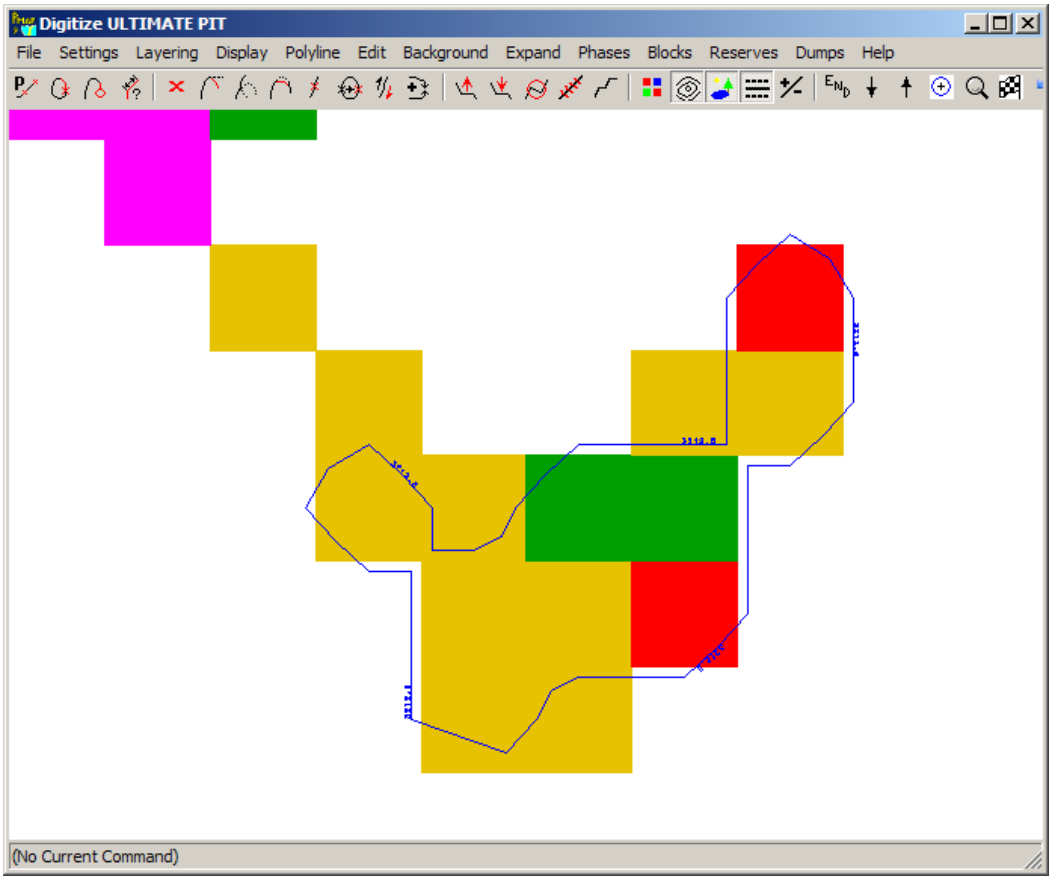


Figure 37 Background Display of Gold Grades with Cone Contour

1.19. Set the Expansion Parameters

In order to design the pit, we need to specify certain expansion parameters. For this exercise, we will use a simple 45 degree slope and a road grade of 10 percent.

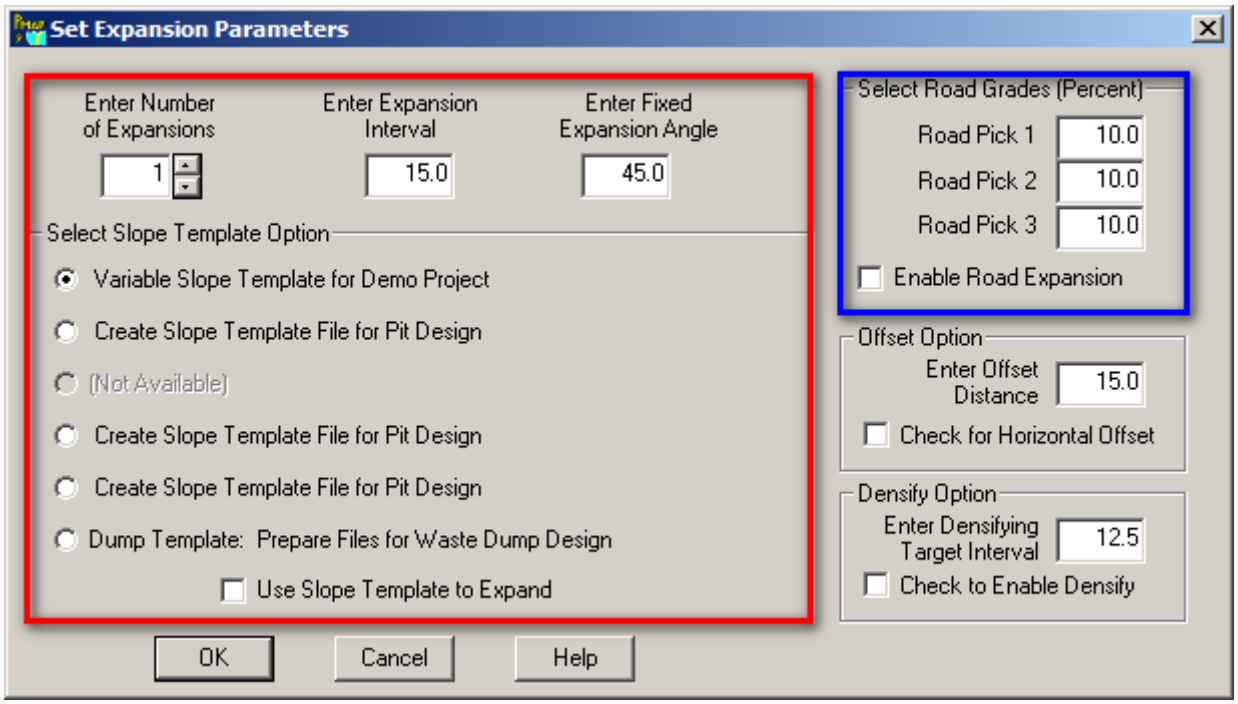


Figure 38 Set Expansion Parameters Dialog

1) Set the number of expansions to 1. Expansion interval to one bench height (15 feet). Fixed expansion angle of 45 degrees. Note that the check box to use a slope template is left unchecked.(red)
2) Select the road grade for each road pick. We will only be working on one road at a time, so only road pick 1 is relevant.(blue)
3) The offset option and densify option are both disabled.

We will assume that our road width needs to be 50 feet for this design. The design is performed using bench mid-level contours. This type of design is generally of sufficient accuracy for all but the most detailed design requirements. PolyMap can be used to generate a design with toe and crest lines. We will stick to the more simple design for our example. We will design from the bottom up. To help in our decision making process, we will turn on the +/- bench option and set the display to show one bench above and one bench below. From menu Layering, select Set Level Limits.

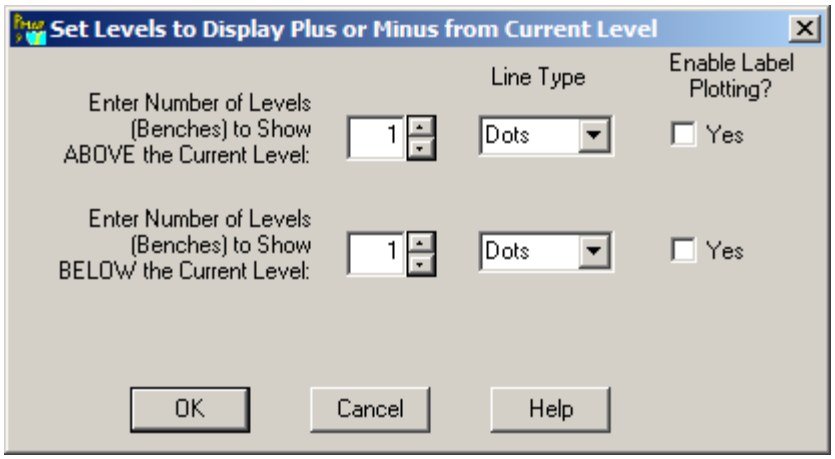


Figure 39 Set Level LImits Dialog

1) We choose 1 level above, and 1 level below the current bench. The lines will show as dots. Label plotting can be disabled to eliminate some of the clutter. The label plotting option applies to our designed pit outlines and not to the background phases. The background phases have their own label plotting control.
2) After making the changes, be sure to enable the +/- layer view by clicking the icon, or using the shortcut key (control-W)

Here is what the design screen looks like after the above changes. Note that since we are at the bottom bench of the cone pit, only that contour plus the one for the layer above shows.

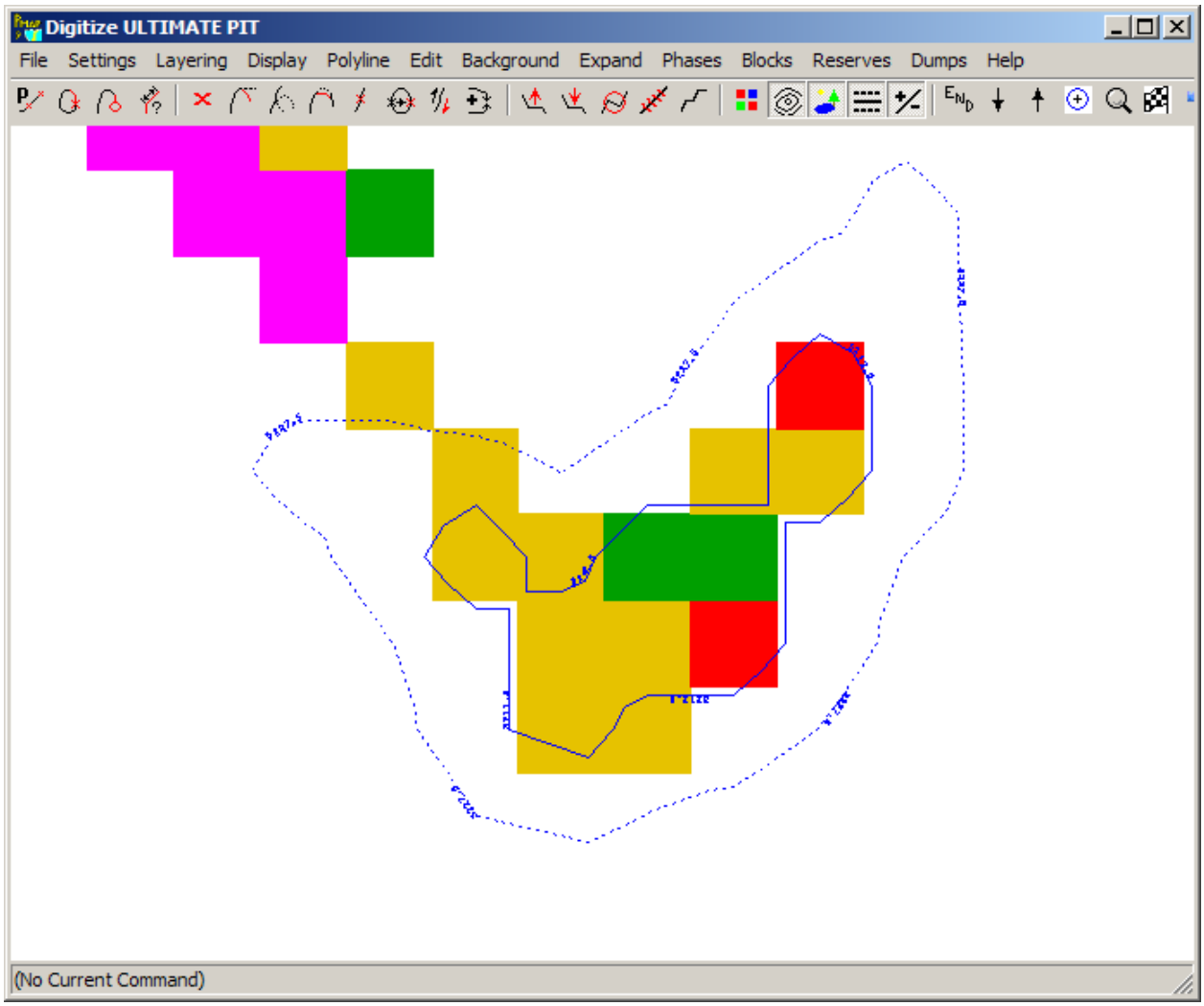


Figure 40 Set +/- Limits Display Screen

1.20. Set Bullseye Cursor Radii

The bullseye cursor can be a useful tool under certain circumstances. We will set the inner radius to our road width, and the outer radius to one half the horizontal distance our ramp should take up for a one bench change in elevation. With a 10 percent road grade and 15 foot benches, that distance is 75 feet. Go to Settings, Set Bullseye Cursor to make the following changes.

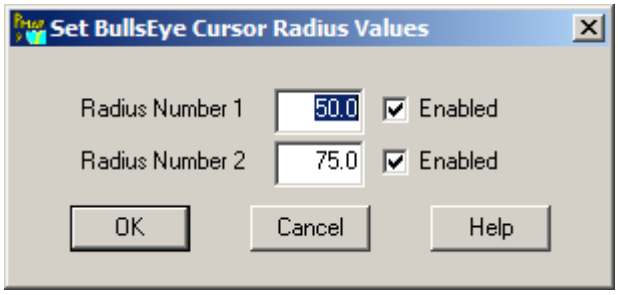


Figure 41 Set Bullseye Cursor Dialog

1) Set radius 1 to 50 feet, and radius 2 to 75 feet. Make sure that both are enabled.
2) After changing the settings, enable the bullseye cursor by clicking on the bullseye cursor icon, or by typing the shortcut command (control-Y).

1.21. Digitize the Pit Base Polyline

With the bullseye cursor turned on, we can see that the bottom bench of the cone design is pretty small. It isn't even one road width wide. We make a decision to start our design one bench higher, on the 3220 toe elevation bench (level 29). Our mid-bench contour/polyline should be at elevation 3227.5 feet.

To add a polyline, click on the polyline icon, or use the shortcut key (control-P). In the lower left hand status bar, we see that Polymap thinks we are creating a line at elevation 3220, the toe elevation, rather than the mid-bench elevation. To fix this, go to the Polyline menu, Enter Elevation of Polyline, and enter 3227.5. Click OK, then click again on the Polyline icon.

Digitize the polyline clockwise around the cone outline. Don't try and match the outline exactly, but straighten out the pit sides. After digitizing the road segment, use the Set Length of Last Digitized Segment (control-alt-L) to set the segment to exactly 50 feet. Be sure and close the polyline. It should look something like this (background display turned off in order to show the outline more clearly).

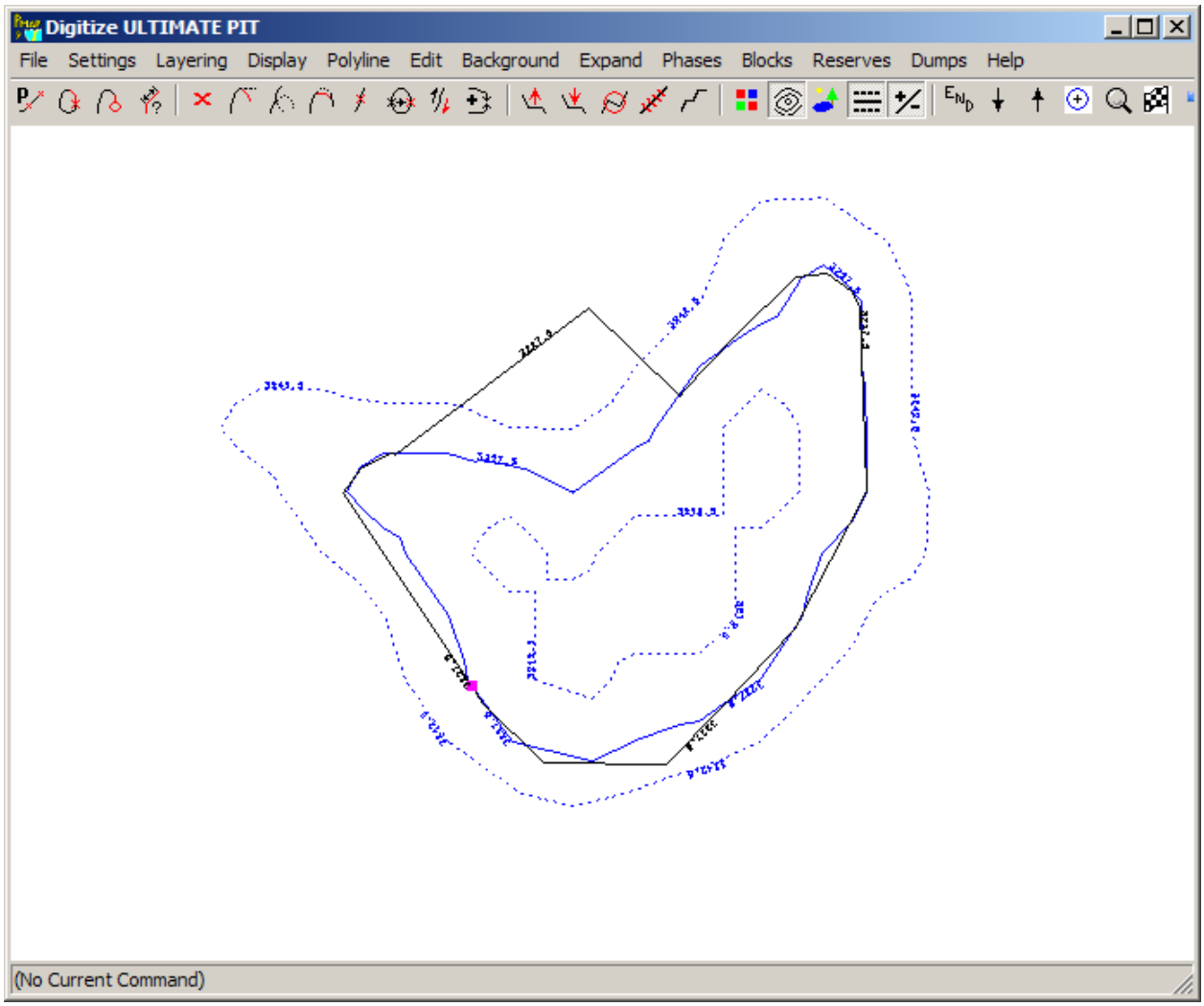


Figure 42 Pit Base Polygon with Road

1.22. Expand the Base Polygon Up One Level With Road

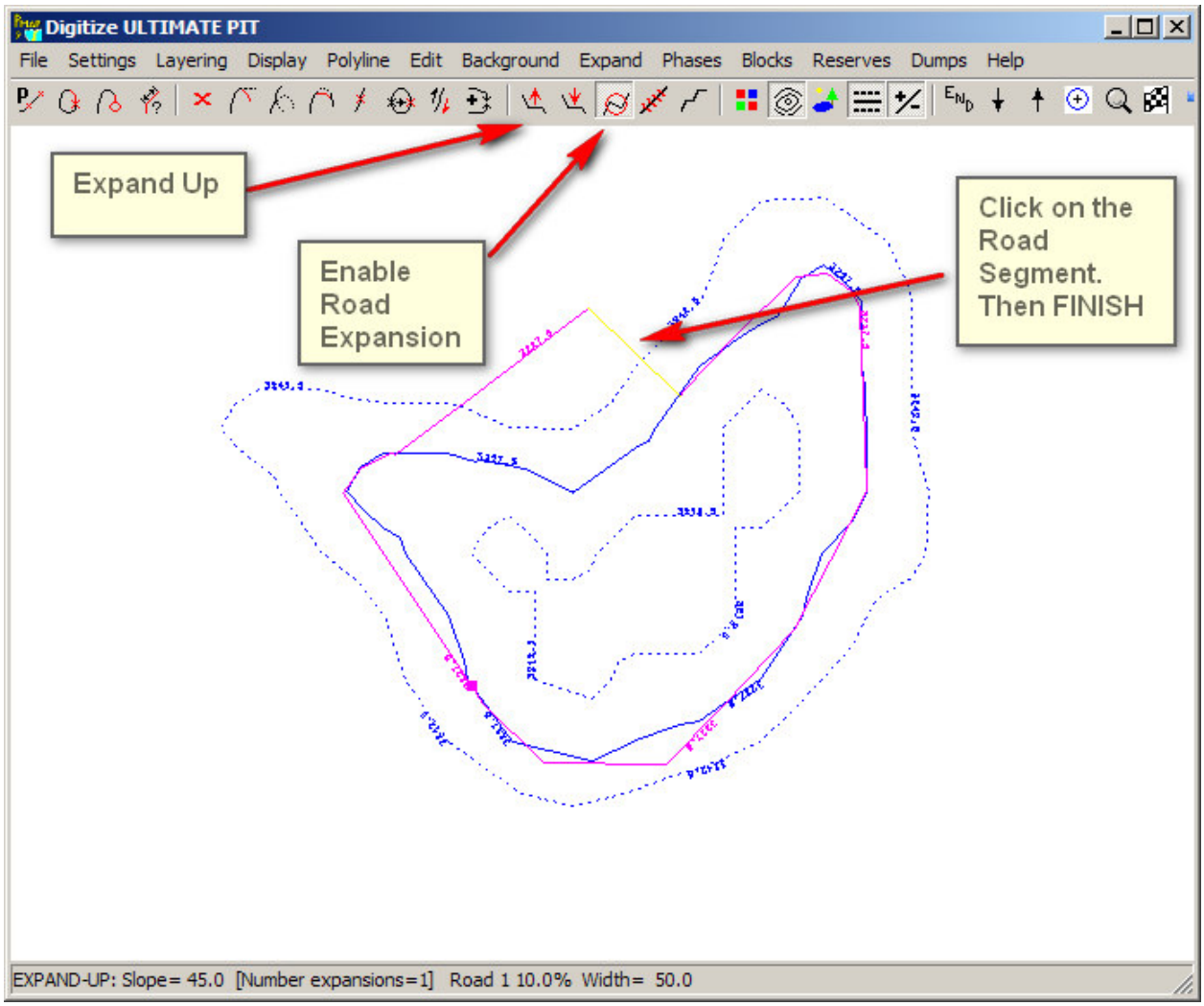


Figure 43 Expand Pit Base With Road Upwards

1) Click on the Enable Road Expansion icon.
2) Click on the Expand Up icon. Then click somewhere on the road segment.
3) Click on the FINISH icon, or press F-1.
4) A Polyline on the next bench will be drawn as a black dotted line. See the following figure.

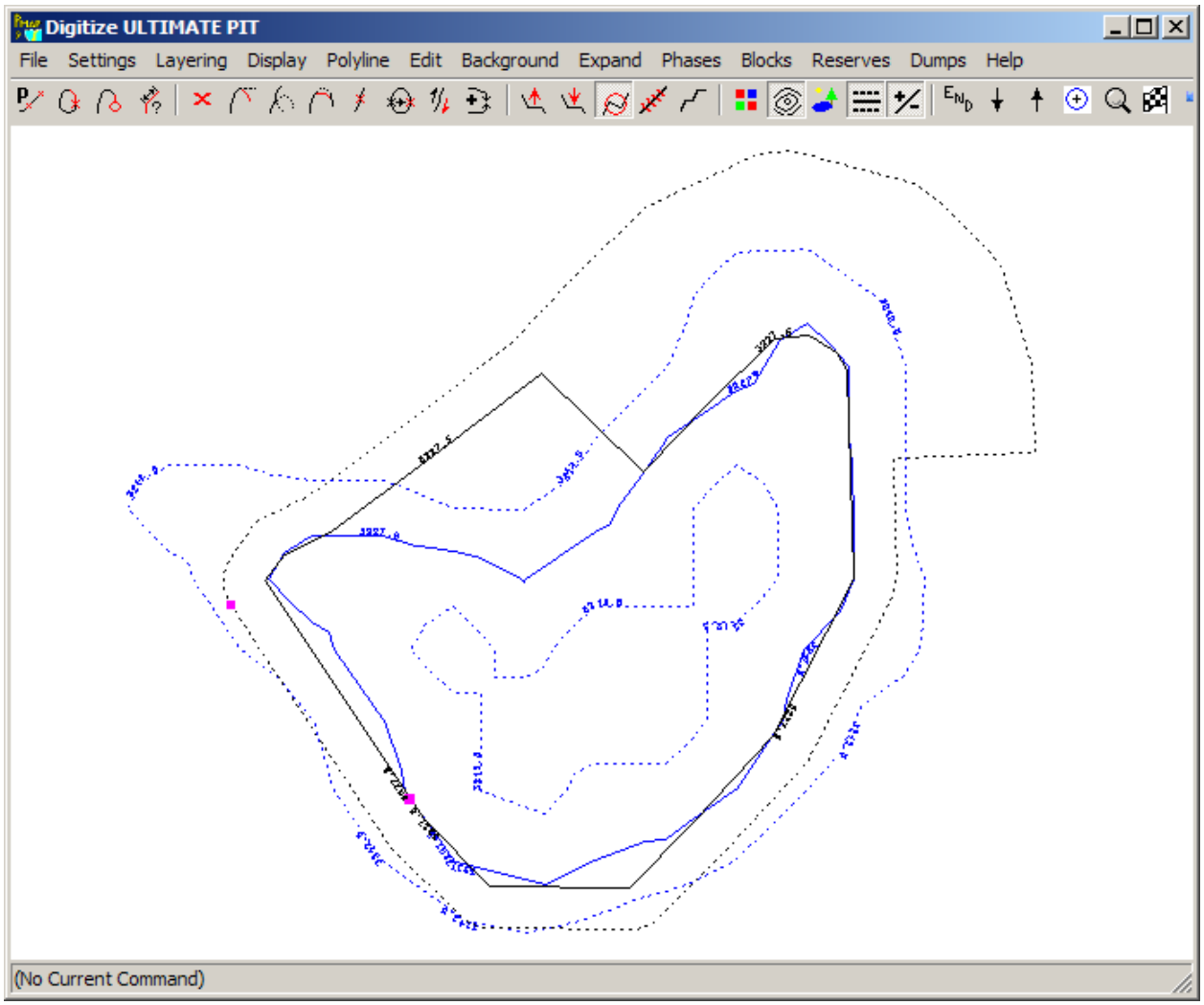


Figure 44 View of Expanded Polyline on Bench Above Current Bench

1) Change current bench to the next one up by pressing the + key on the numeric key pad, or click on the Display Up One Level icon. Turn off the +/- limits, and turn on the background display of the gold grades.
2) You will see a display similar to the following. If necessary, the outline could be adjusted to more closely fit the cone outline. For our example, we will leave it as is, and expand up another bench.

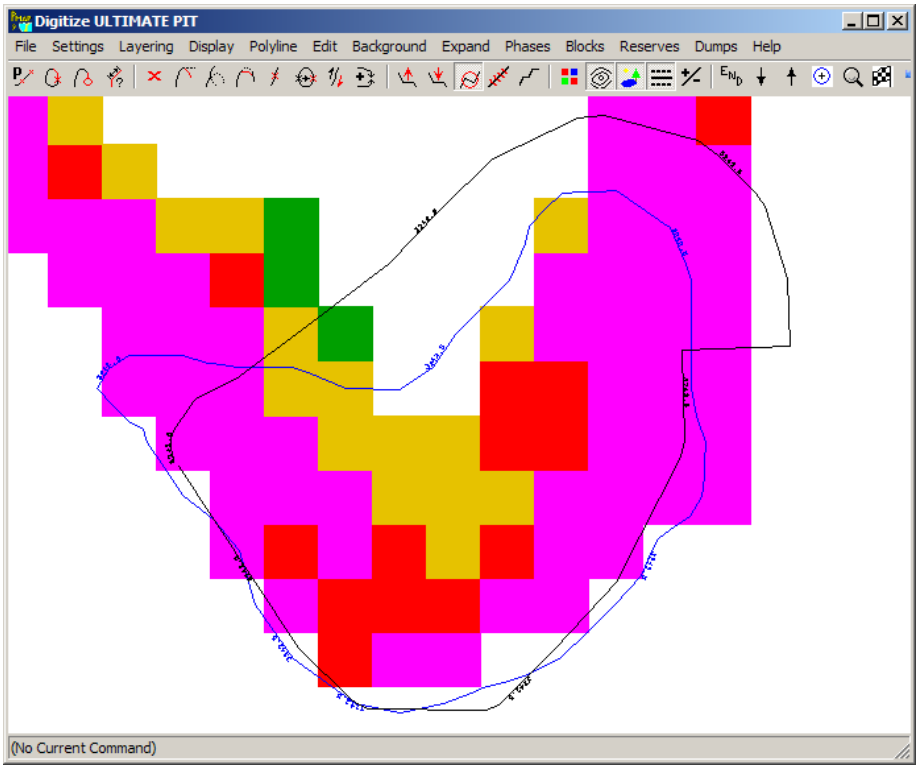


Figure 45 View of Expanded Bench with Gold Grade Background

1.23. Completed Design

1) Continue the upward expansion process until the ramp daylights.
2) Expand levels above the exit without a ramp until no more cutting of original topography is occurring. The following screen shot shows the completed pit design without the cone contours or the gold grade background.

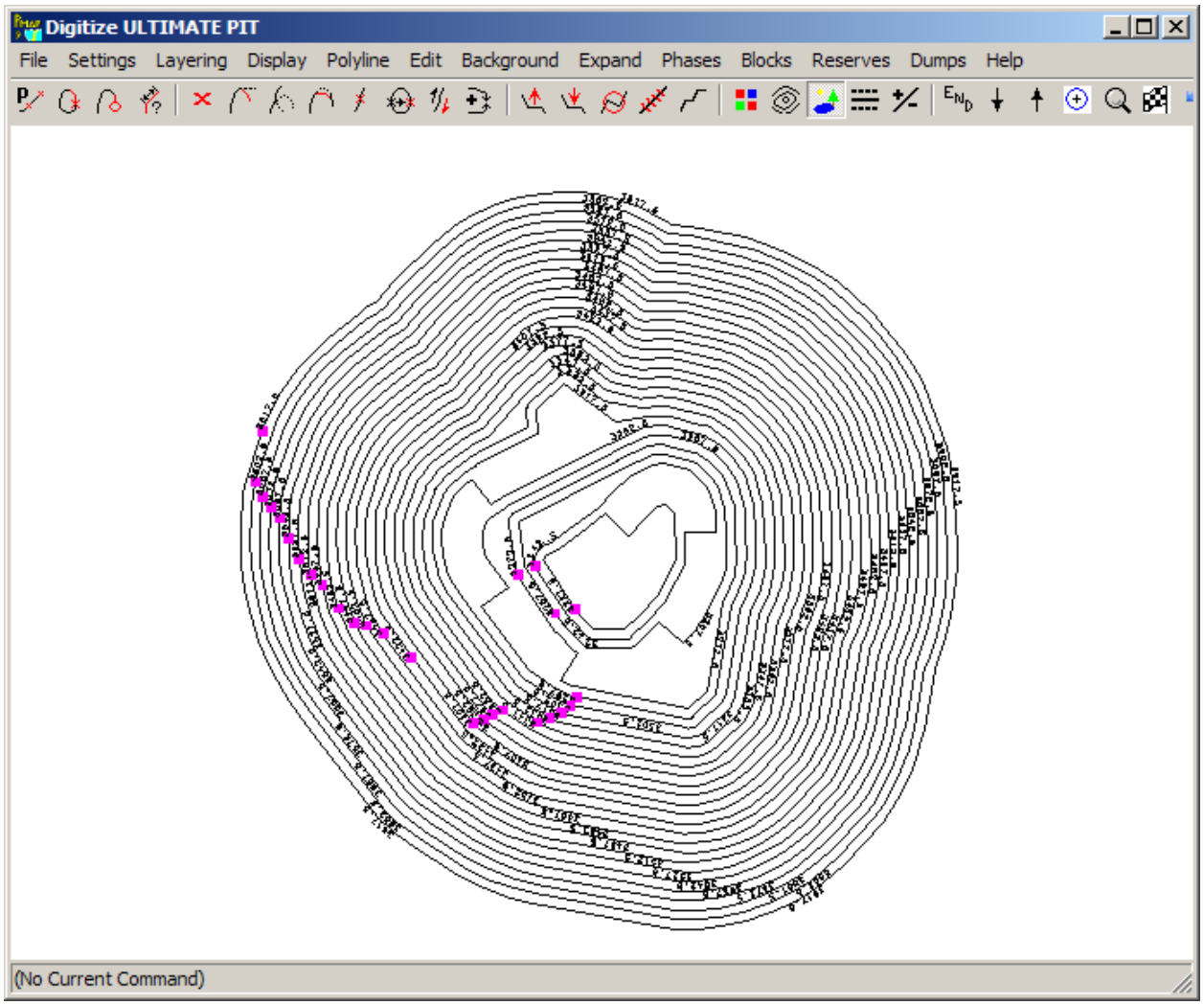


Figure 46 Completed Pit Design

1.24. Meshing the Design with Original Topography

A composite map of the pit design and starting topography can be generated using the PolyMap meshing program. In order to use the program, both maps must have polylines entered in the correct sense of direction. When a pit design is done within PolyMap, the sense of direction is already correct. When polylines have been imported from another source, they should be checked for correct direction before meshing. (1.13)

Mesh the map using Map Data Entry, Mesh Pit Design(s) with Prior Topography. Here are the proper input parameters for meshing the ultimate design from this section.

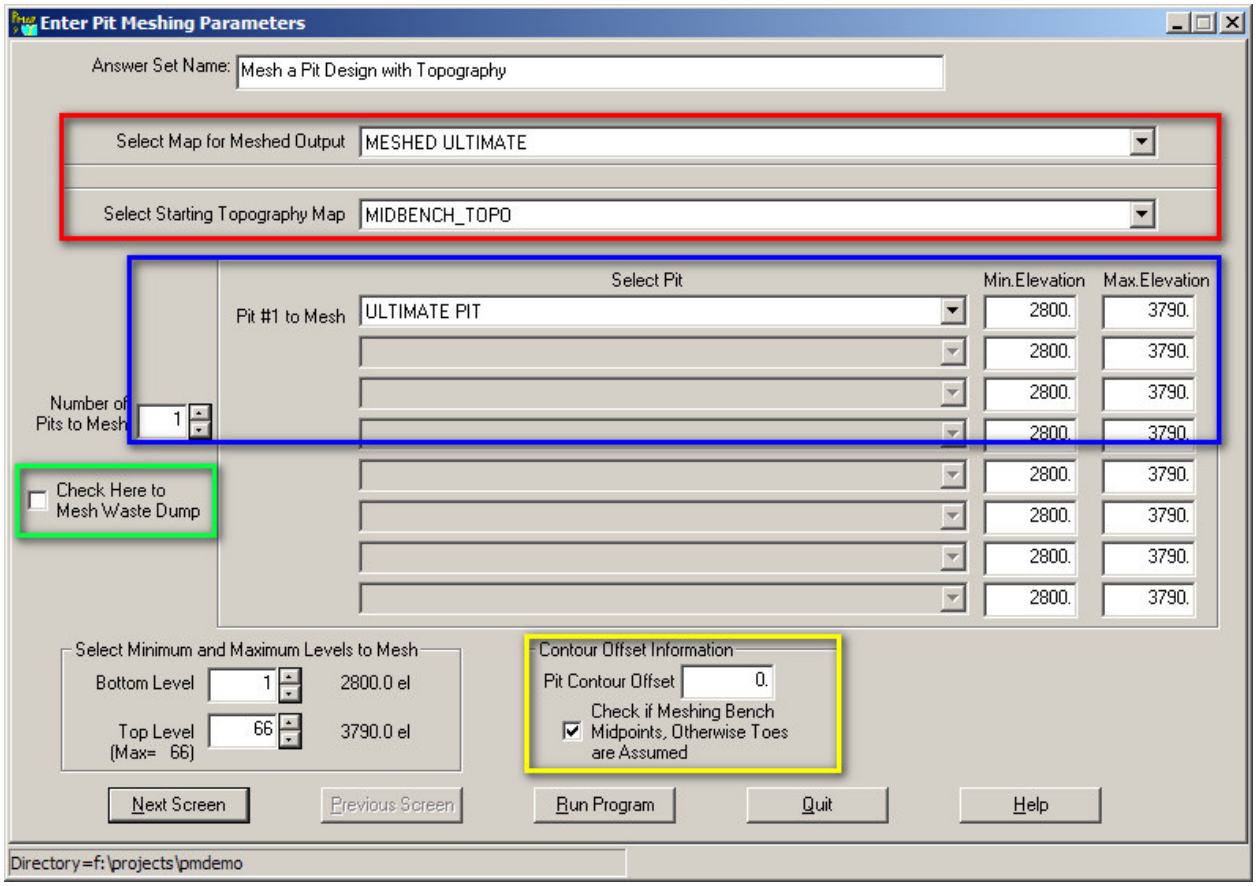


Figure 47 Meshing Input Parameters

1) Select the map for meshed output, and the starting topography. The meshed output map gets completely overwritten, so be careful with this choice.(red)
2) The starting topography is normally the topography map for the project. In this case, with 15 foot benches, there are not topo contours available at this interval. Instead, we use the imported MIDBENCH_TOPO map.(red)
3) One or more pits can be meshed, and minimum/maximum elevation ranges can be specified. This feature is available for use in preparing detailed “dig maps” where the meshed output is actually a composite of several phases. In this case, we simply choose one phase, ULTIMATE PIT.(blue)
4) We are meshing a pit design. If we were meshing a waste dump, then the Waste Dump check box would need to be checked.(green)
5) We are meshing bench midpoints, so the check box is selected.(yellow)

After running the mesh program, create a display of the resulting meshed map.

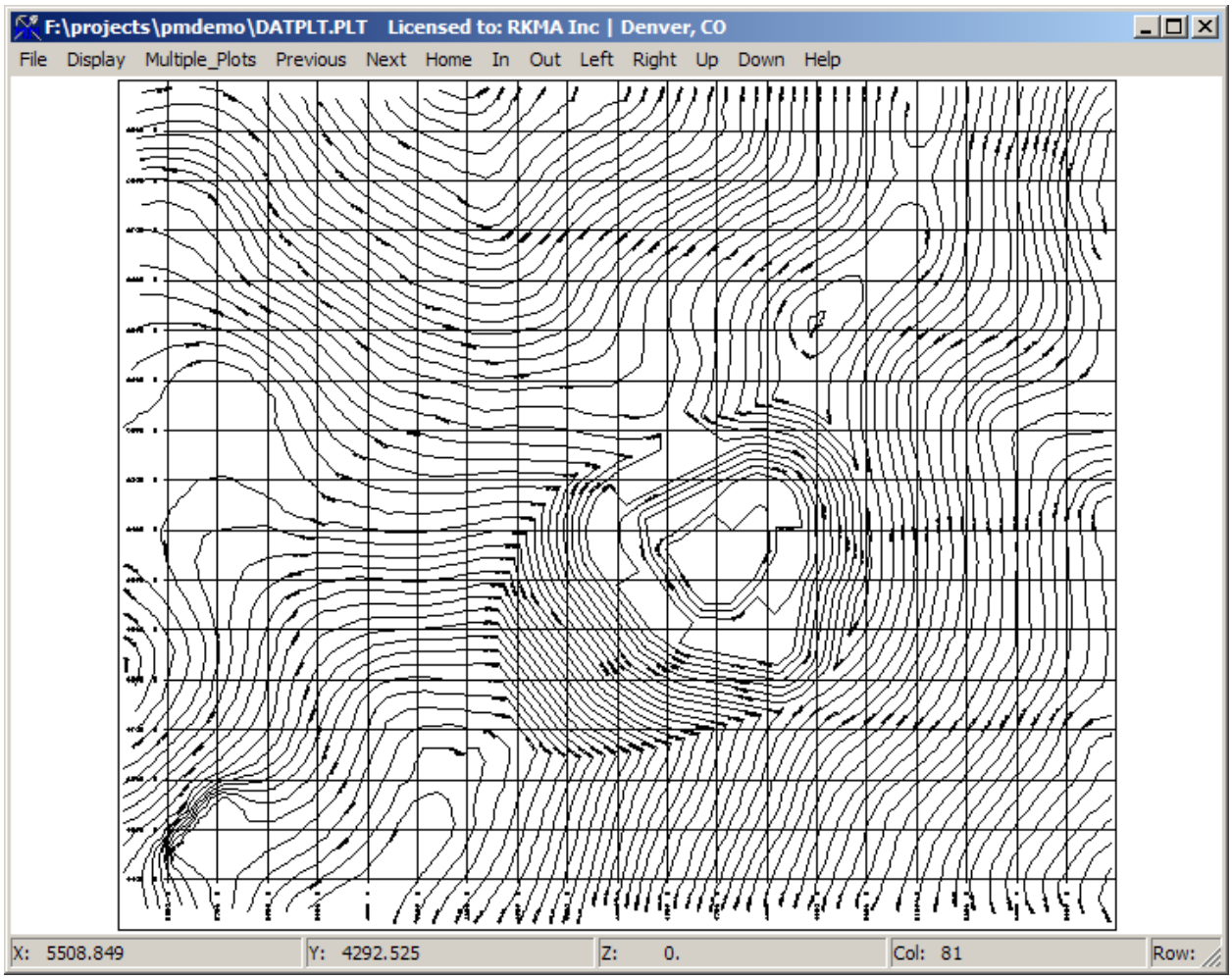


Figure 48 Display of Meshed Ultimate Design

3) Digitize Geology Zones on Sections

PolyMap can be used to digitize geology on sections or plans. The zones can be exported as polylines, or can be further combined into wireframe models. This section will demonstrate how ore zone polygons can be drawn on four different sections.

The sections have been imported in a previous section of this document.(1.7) The sections are named 4500E, 4600E, 4700E, and 4800E. Prior to digitizing our ore zones, we generate a set of “bare bones” cross section plots in MicroMODEL showing composites that are above the ore grade cutoff in red and below the cutoff in yellow. No topo, no grid lines, and no plan view are requested.

1.25. Create the Section Plots in MicroMODEL

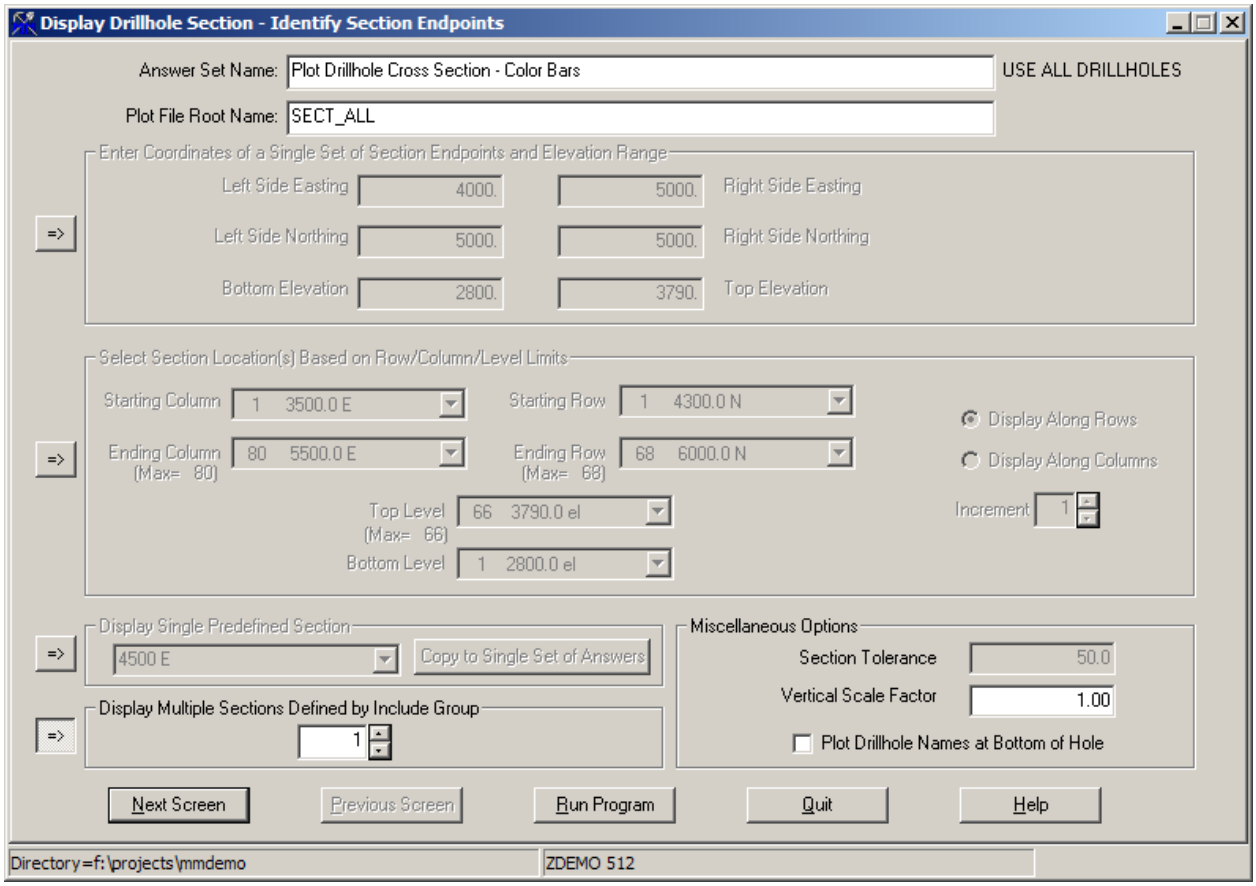


Figure 49 Drillhole Section Input Screen 1

1) In the first screen, we specify the plot file name SECT_ALL. We also choose to display multiple sections defined by include group 1. Include group 1 is section 4500E through section 4800E.

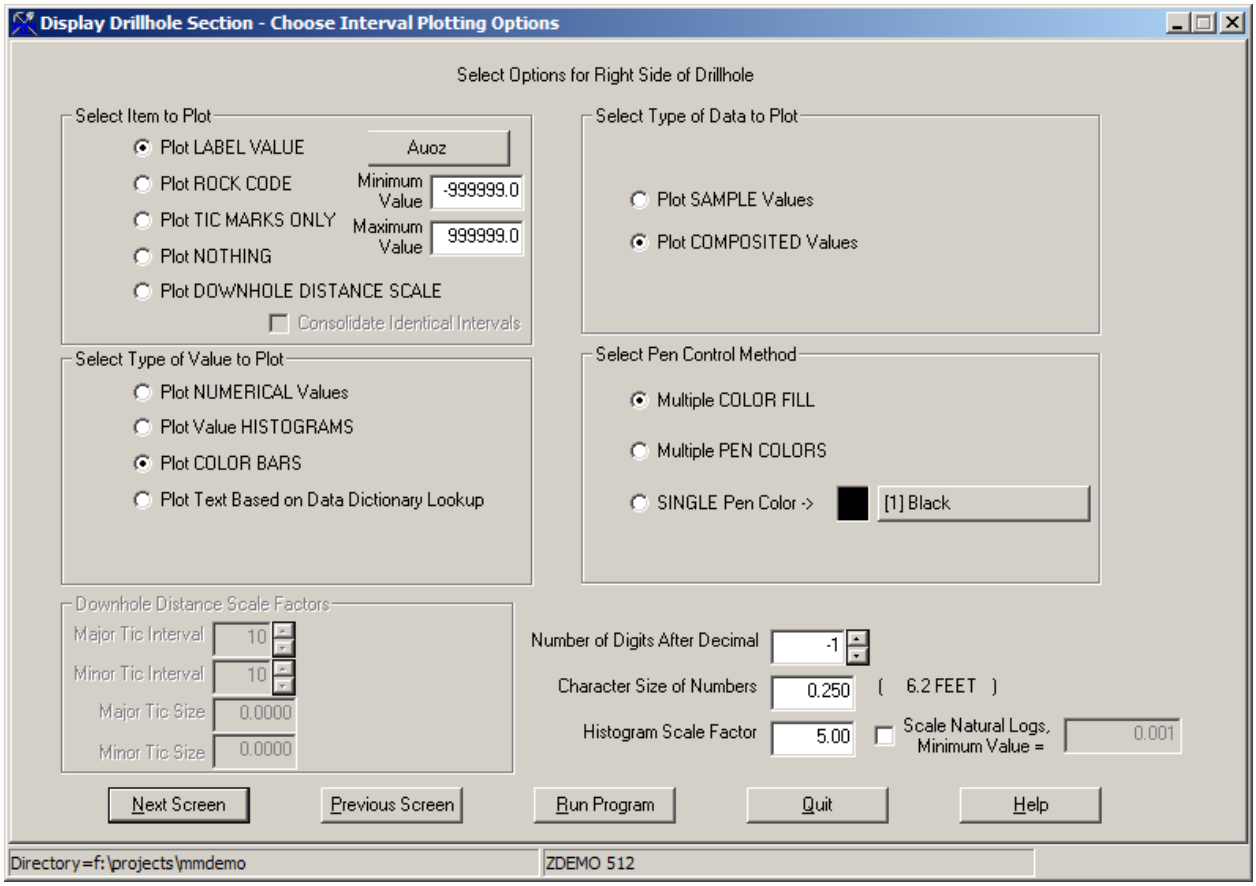


Figure 50 Drillhole Section Input Screen 2

1) In the second screen, we specify that Auoz be plotted on the right side, using multiple color fill color bars. The color bar width is set by the histogram scale factor. In this case, they will be five feet wide.

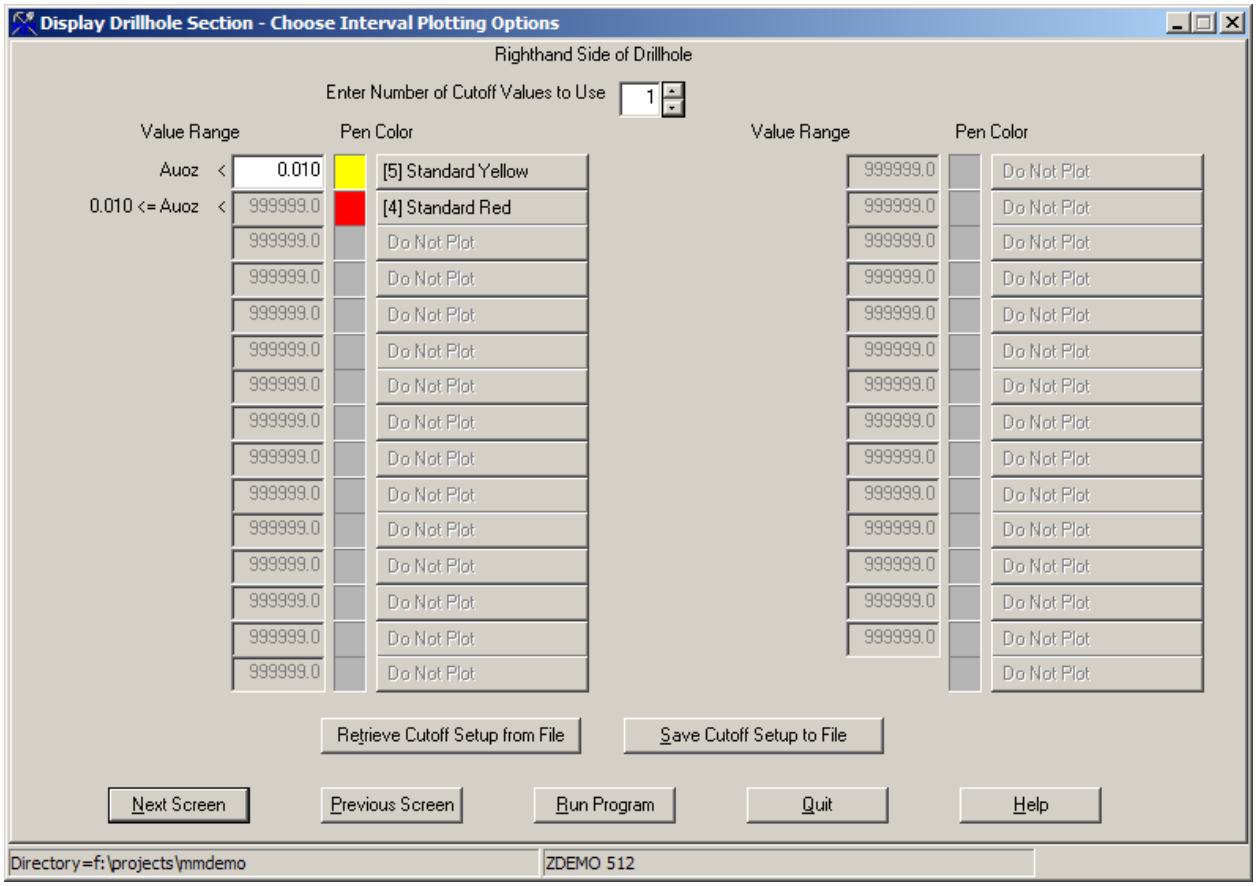


Figure 51 Drillhole Section Input Screen 3

1) In this screen, we define our color scheme. Composites that are at or above our ore cutoff of 0.010 opt will display in red. Others will display in yellow.

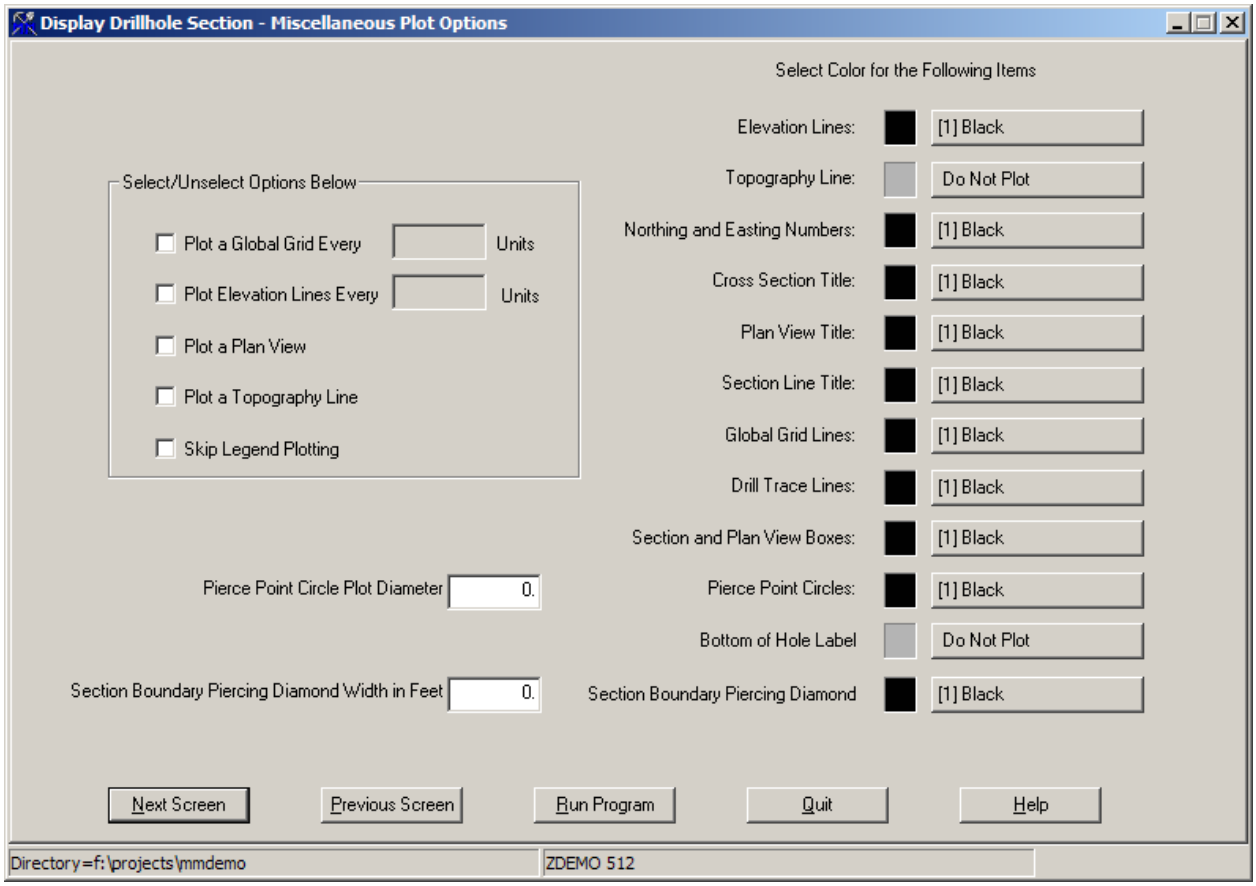


Figure 52 Drillhole Section Input Screen 4

1) In the final screen, we unselect all of the options so that we get a very basic “bare bones” plot of the section.

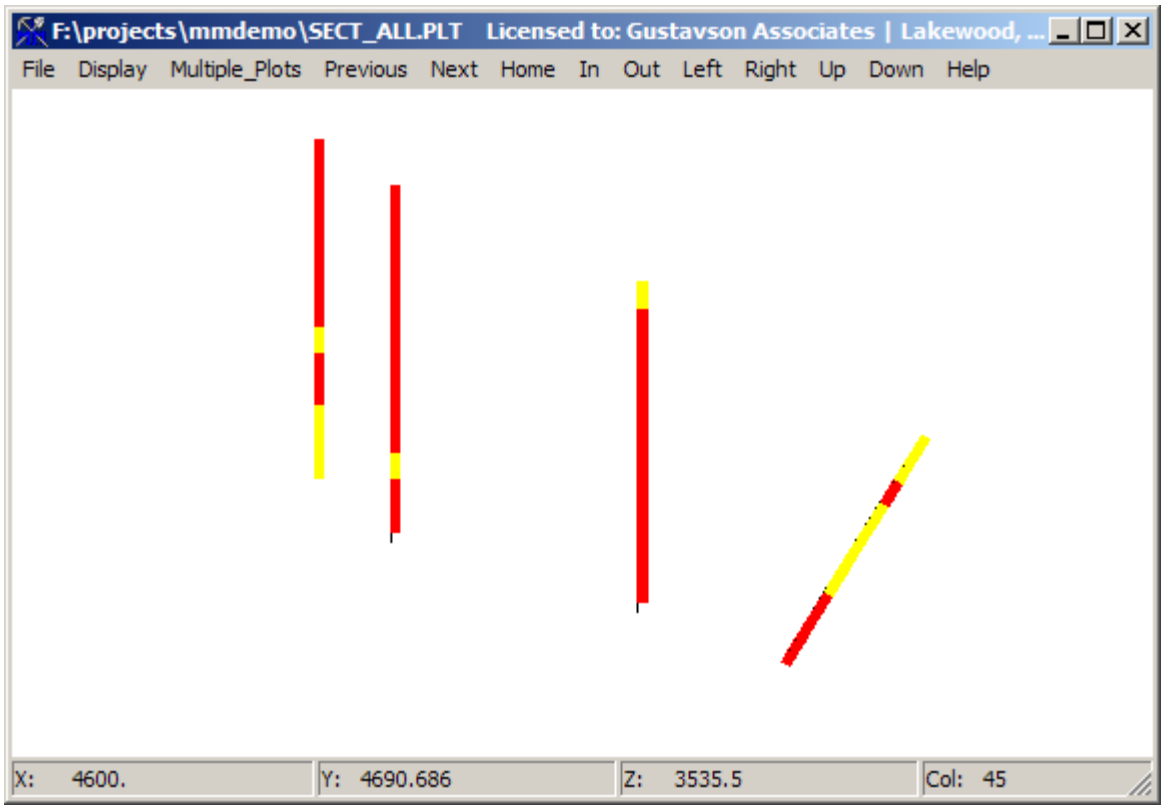


Figure 53 Drillhole Section Plot

Here is the section plot for 4600E. There are four separate sections contained in the single plot file called SECT_ALL.PLT.

1.26. Setup for Using the PolyMap Geology Digitizer

Before starting the geology input program, we must first group the four sections into a single include set in PolyMap. We will group 4500E through 4800E into include set 1. From System Setup, select Change Include Sets. Change the name of the first include set to" N-S Sections":

Include Set #	Description
1	N-S Sections
2	Include Set 2
3	Include Set 3
4	Include Set 4
5	Include Set 5
6	Include Set 6
7	Include Set 7
8	Include Set 8

Figure 54 Change Include Set 1 Name to "N-S Sections"

In the second screen, check the include set 1 box for each of the four sections.

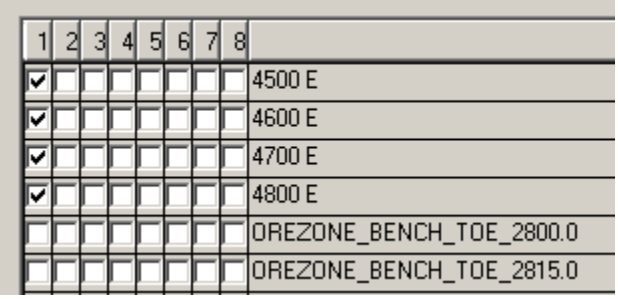


Figure 55 Check Include Set 1 for Each of the Four Sections

1.27. Start the Geology Input Program

From Map Data Entry, choose Digitize Geologic Data.

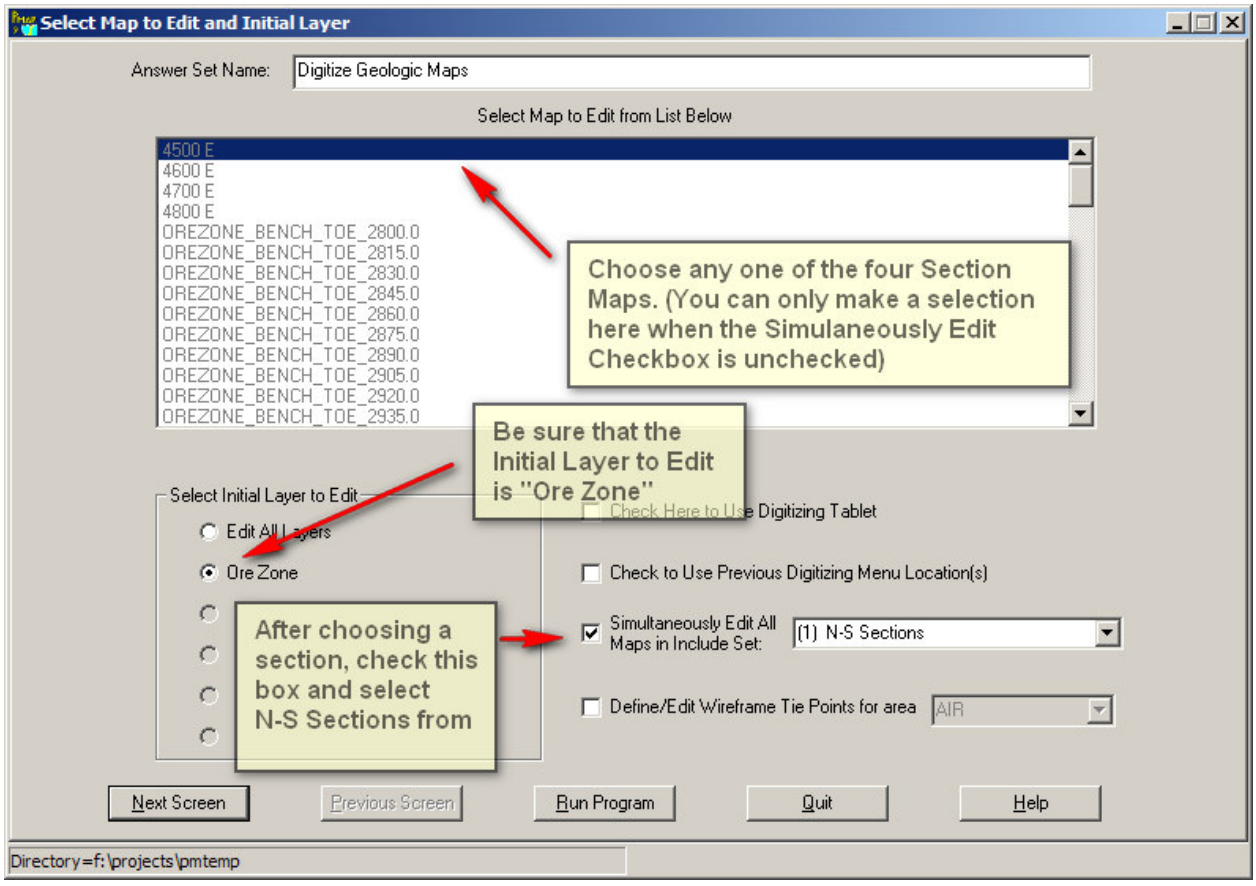


Figure 56 Digitize Geology Input Screen

1) First, choose section 4500E in the list box. Then, check the “Simultaneously Edit All Maps in Include Set” box. Select “N-S Sections” from the dropdown menu.
2) Select the “Ore Zone” radio button as we will be defining the ore zones.

When the editor starts up, we are asked to provide a border label and a topography label. Leave the default values and choose OK. This dialog is shown each time a map is first accessed.

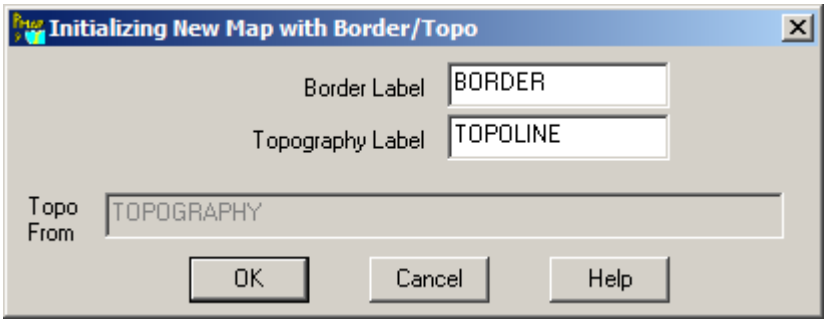


Figure 57 Add Border and Topography Dialog

When a group of maps is selected for the geology input program, the maps are sorted in view order from “front” to “back”. Since these sections are oriented N-S looking West, they are sorted by easting, with the most easterly section being first. Thus, the first section to display is 4800E, as seen below.

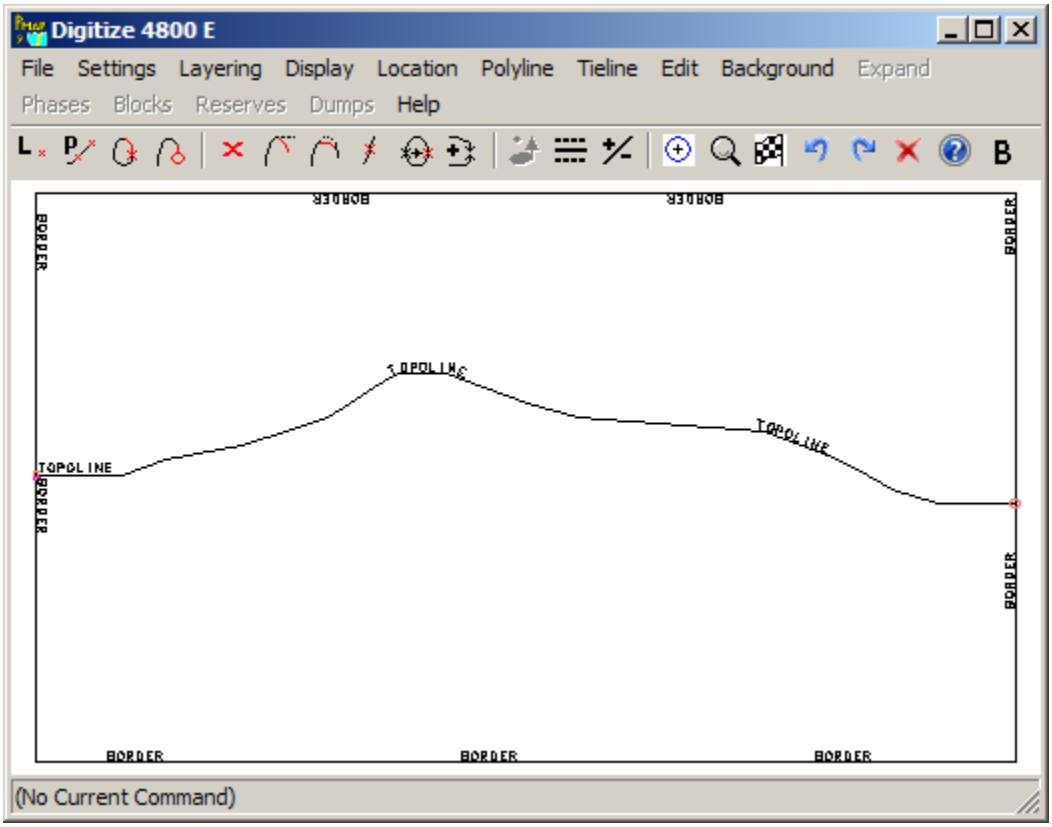


Figure 58 Geology Input Program - First Section 4800E

1) Use the Numeric Keypad Plus and Numeric Keypad Minus keys to move between sections. The minus key moves to the next section behind the current view. The plus key moves to the next section in front of the current view.

2) Move west from section 4800E using the minus key, and allow PolyMap to add the border and topography line for each section. After reaching section 4500E, you should then be able to move forwards and backwards through the sections without the need to initialize the maps.

1.28. Layer Control for Geology Input

There are two methods of layer control that are part of the geology input program. The first controls which of the five possible layers of geology are part of the current view. We have only one layer of geology, ore zone. From the Layering menu, be sure that both "Limit View to Single Geology Layer" and "Ore Zone" are checked.

The second layering control is for showing the first section in front of the current section, and the first section in back of the current section. From the Layering Menu, select "Set Level Limits." Change your settings to the following:

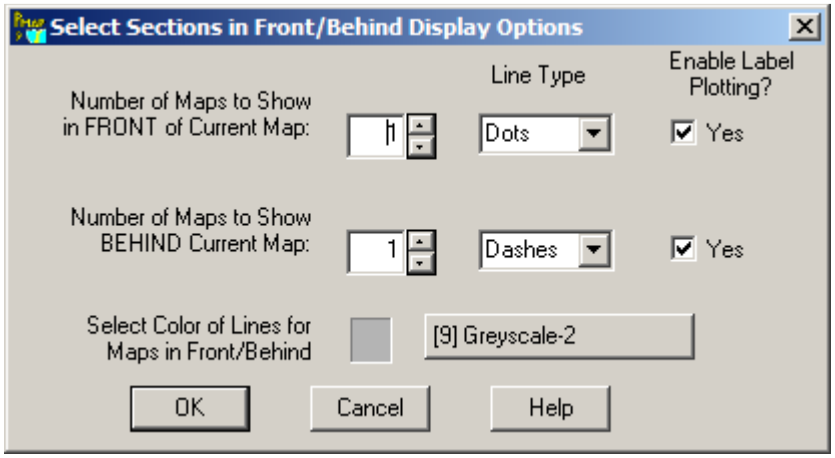


Figure 59 Change Front/Behind View Settings

1) The program limits the number of sections in front/behind to either one or zero. We are opting to show both adjacent sections. Boundary lines for the map in front will be displayed with dots, while boundary lines for the map behind will be displayed with dashes. The lines will display in a medium grey color. Here is the screen for 4600E.

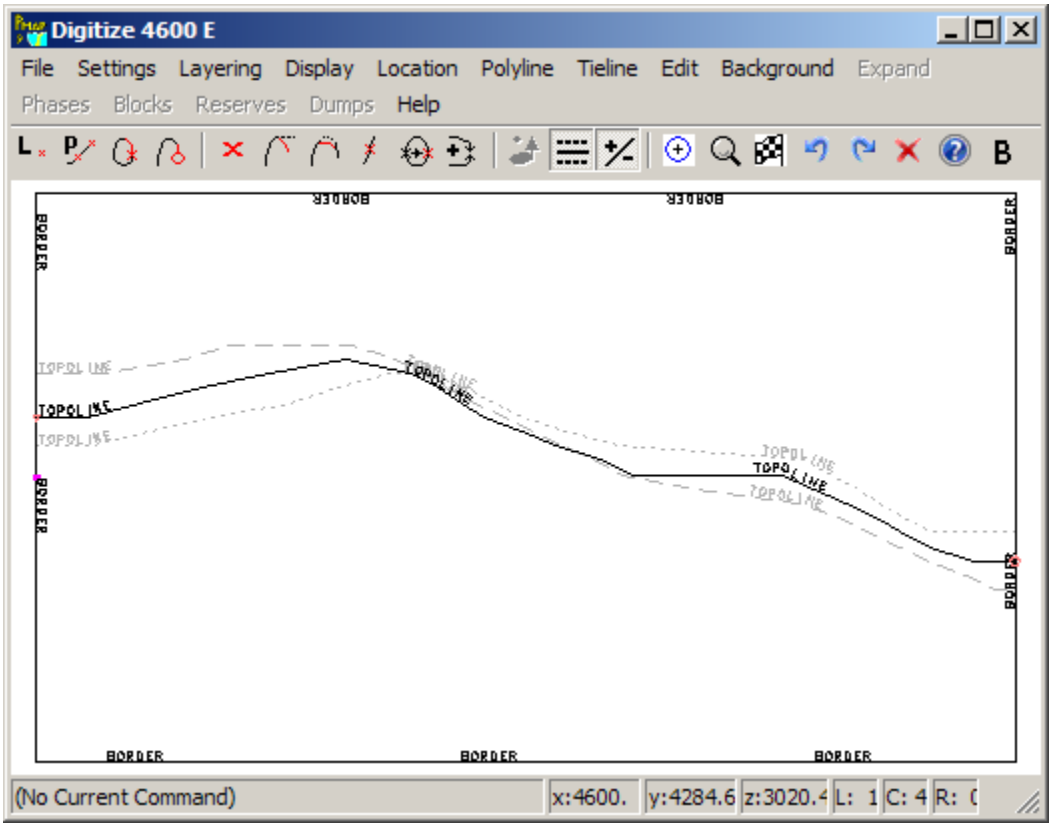


Figure 60 Display Showing Current Section Plus Adjacent Sections

1.29. Background Display for Geology Input

Now we add the drillhole composite gold color bar display from the multi-section plot we created in MicroMODEL. From Background, Set Background Display Parameters, enter the following information.

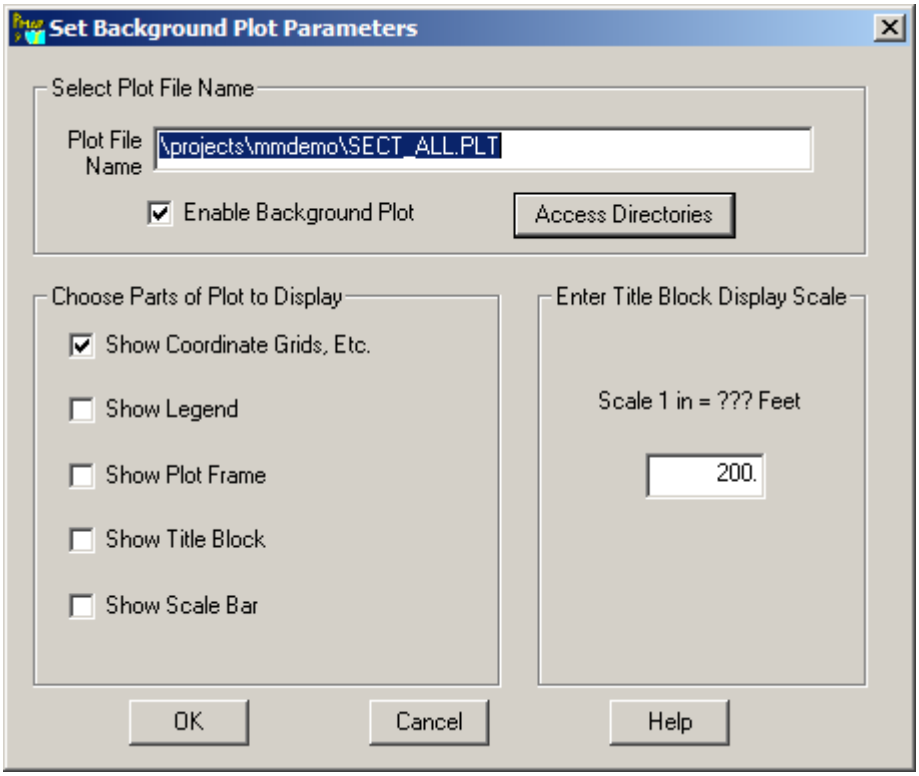


Figure 61 Set Background for Ore Zone Entry

Turn off the display of adjacent sections with the +- icon or via the shortcut key.(control-W) The display now looks like this.

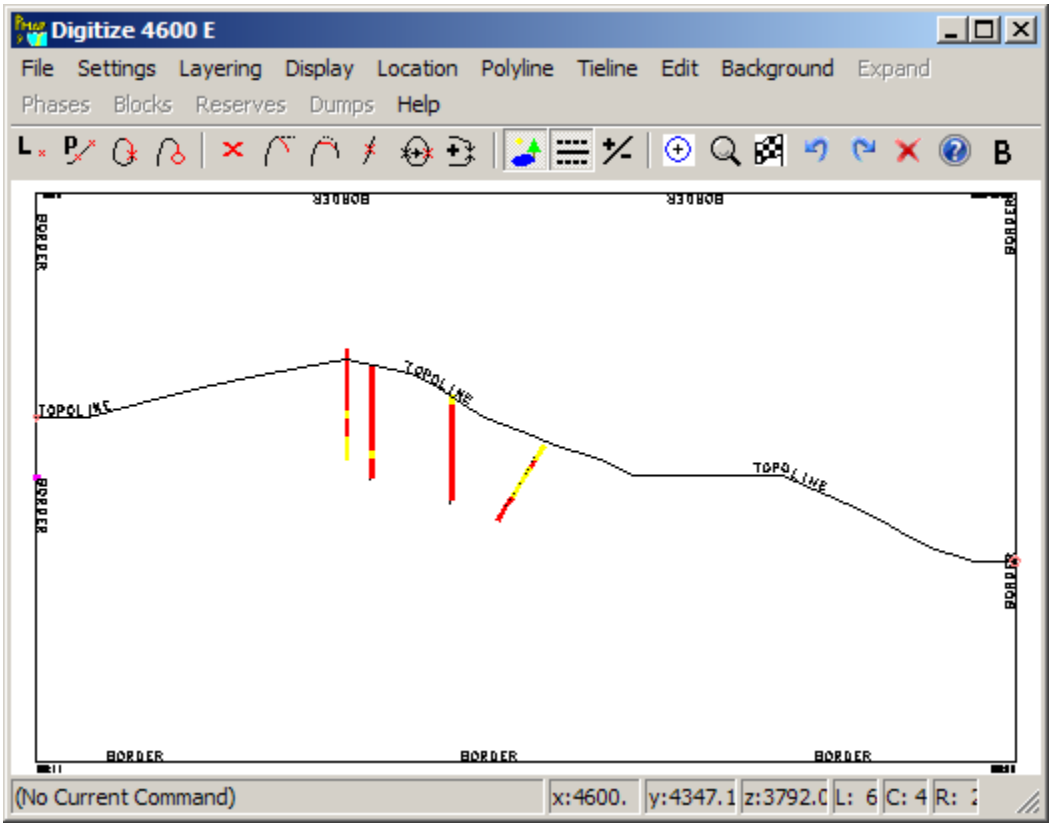


Figure 62 Display of Composites Color Coded by Auoz

1.30. Add the Ore Zone Boundary Line and Location Markers

Add an ore zone boundary line labeled OREBND, and add location markers for AIR, WASTE, and ORE.

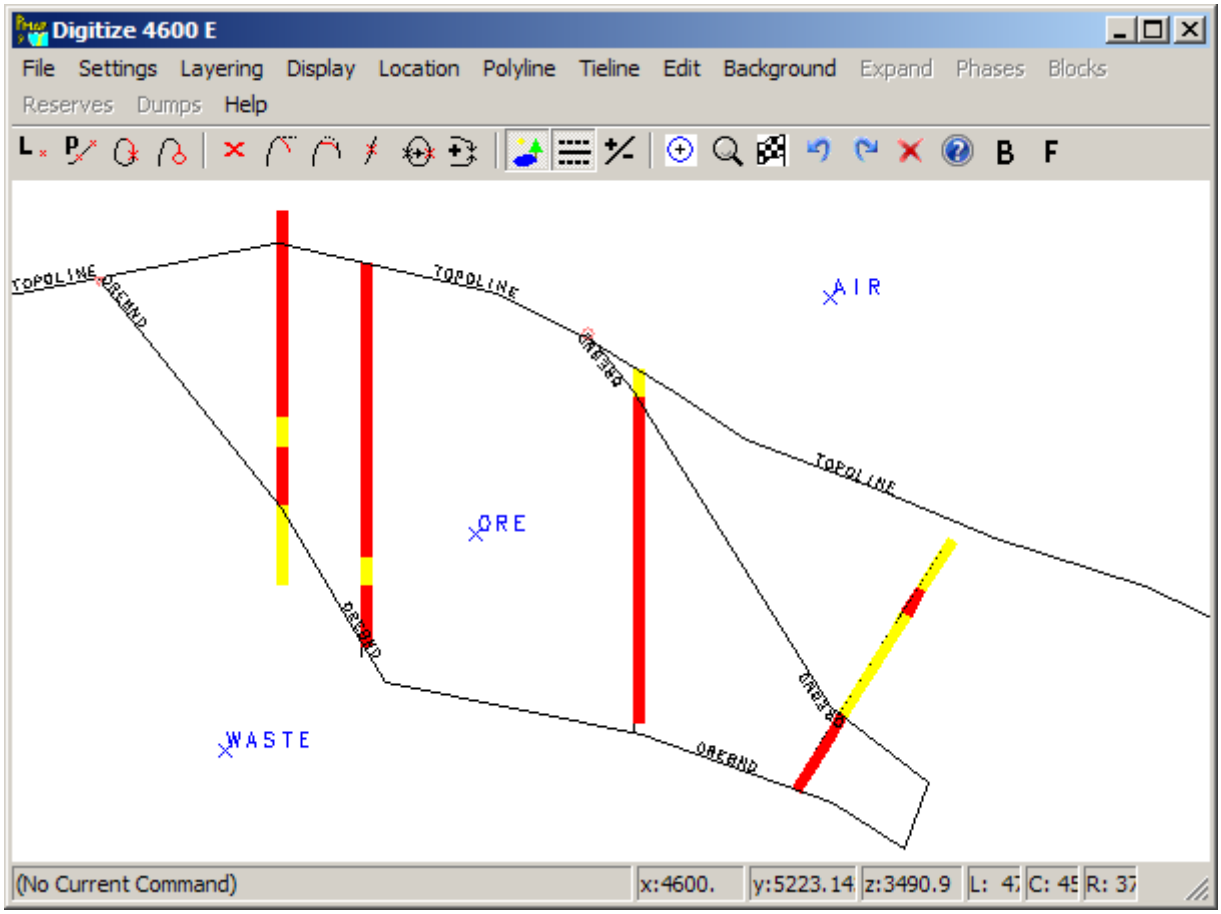


Figure 63 Section 4600E with Ore Zone Boundary and Location Markers

Add an ore zone boundary on the other three sections. The boundary lines from adjacent sections can be used as a guide when digitizing zones on the current section, in order to maintain continuity from section to section. Exit the digitizing program, and update the geology using the Update Digitized Geology and Create Polygons menu choice.

1.31. Update the Geology Zones

After the boundaries and location markers have been added to the four sections, the maps must go through an updating process that generates closed polygonal boundaries for each of the zones. Maps can be updated one at a time, but it is easier to simply choose the “Update All Maps that Need Updating Selection.

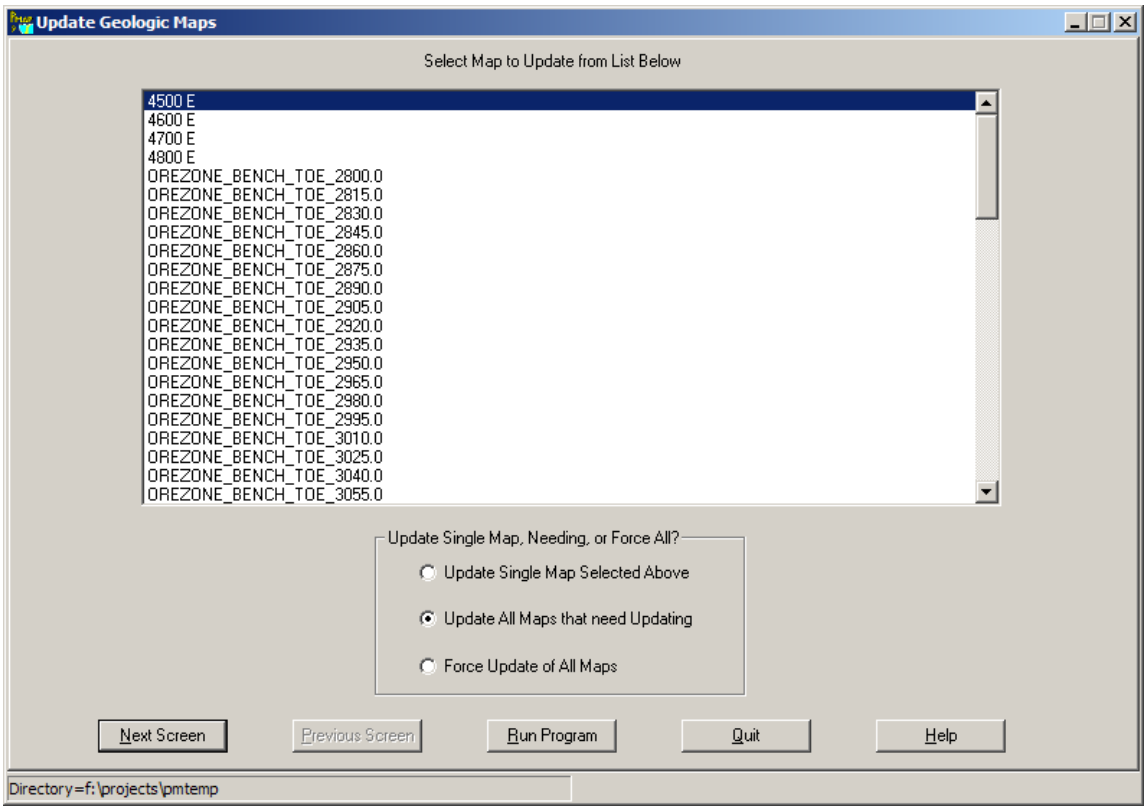


Figure 64 Update All Maps that need Updating Dialog

1.32. Check the Zones by Displaying Colored Filled Polygons

After updating maps, they should be checked with the display filled polygon program, to be sure the zones appear as they should. The following screen shots are from the four sections that just had ore zones added.

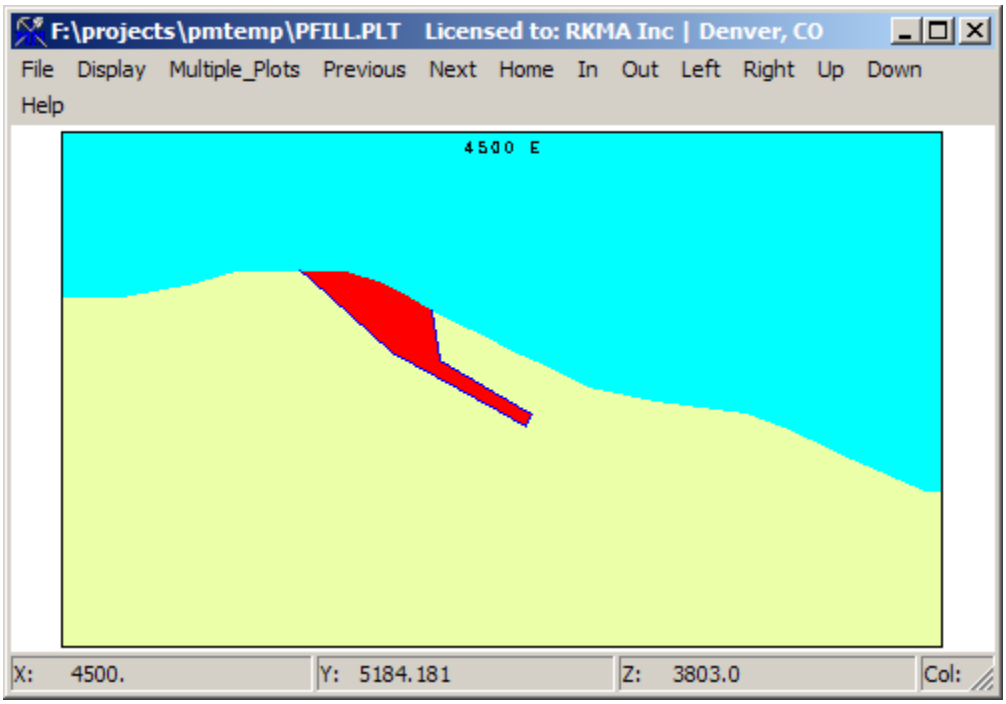


Figure 65 Section 4500E Ore Zone (Red)

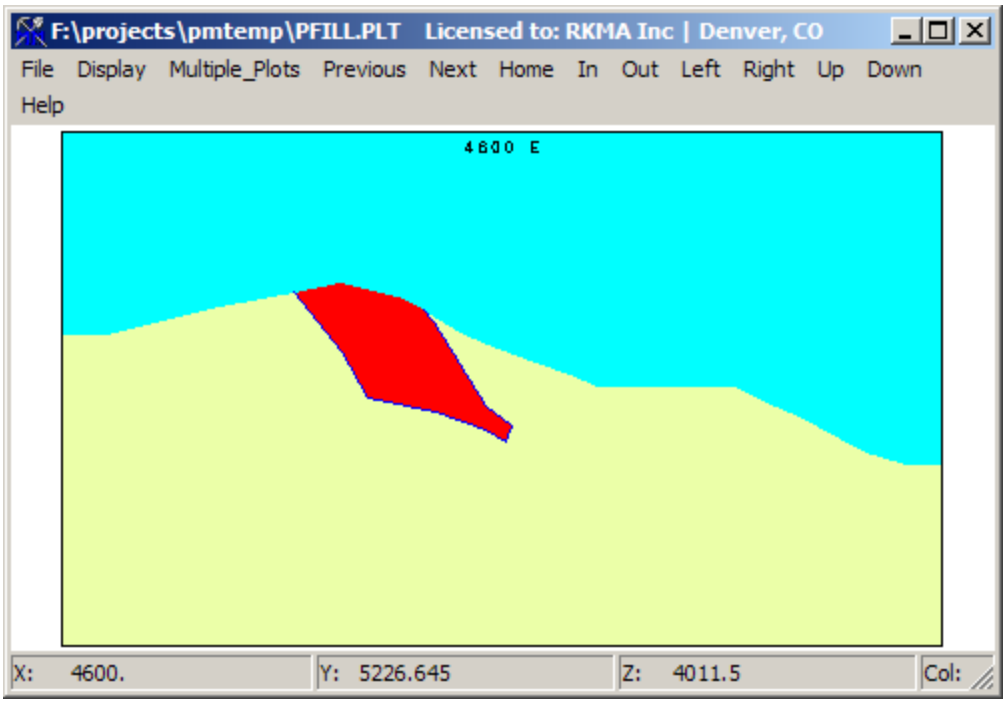


Figure 66 Section 4600E Ore Zone (Red)

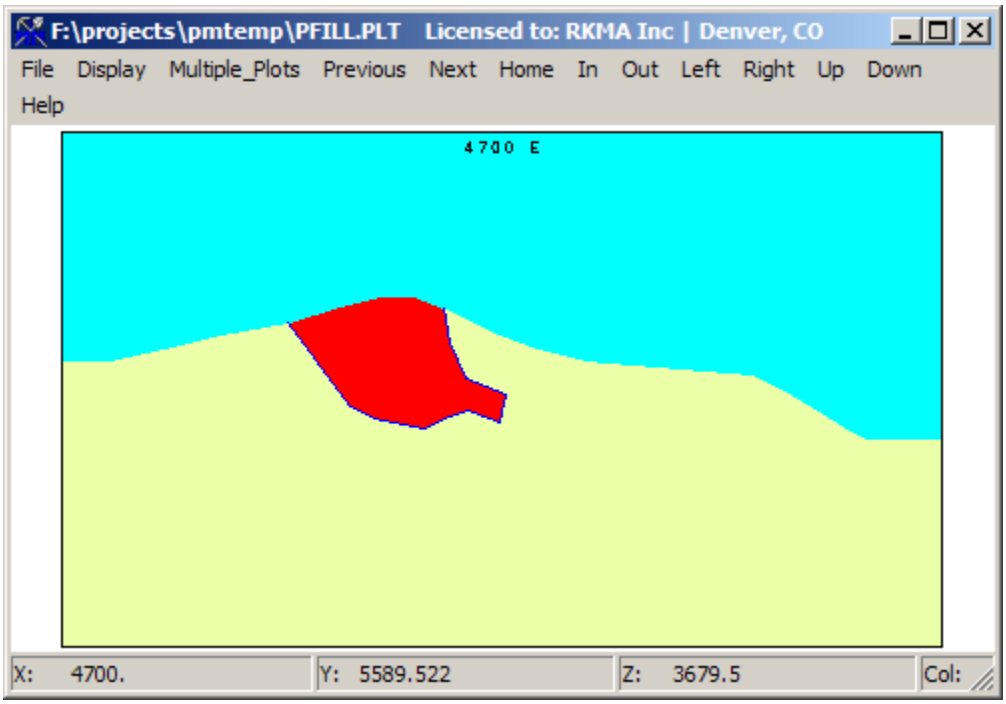


Figure 67 Section 4700E Ore Zone (Red)

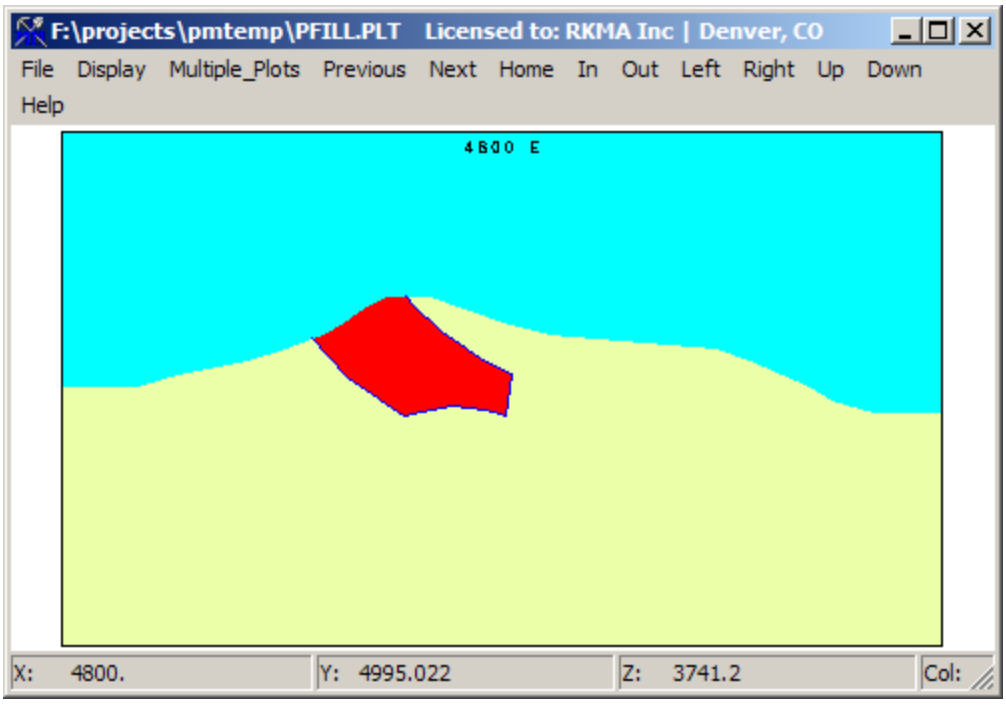


Figure 68 Section 4800E Ore Zone (Red)

1.33. Create Rock Model Coding File from Sections

The ore zones can now be exported into a file that can be used by MicroMODEL to update the rock model from section polygons. From the Map Import/Export menu, choose “Create MicroMODEL POLY.RKS for Section Coding”.

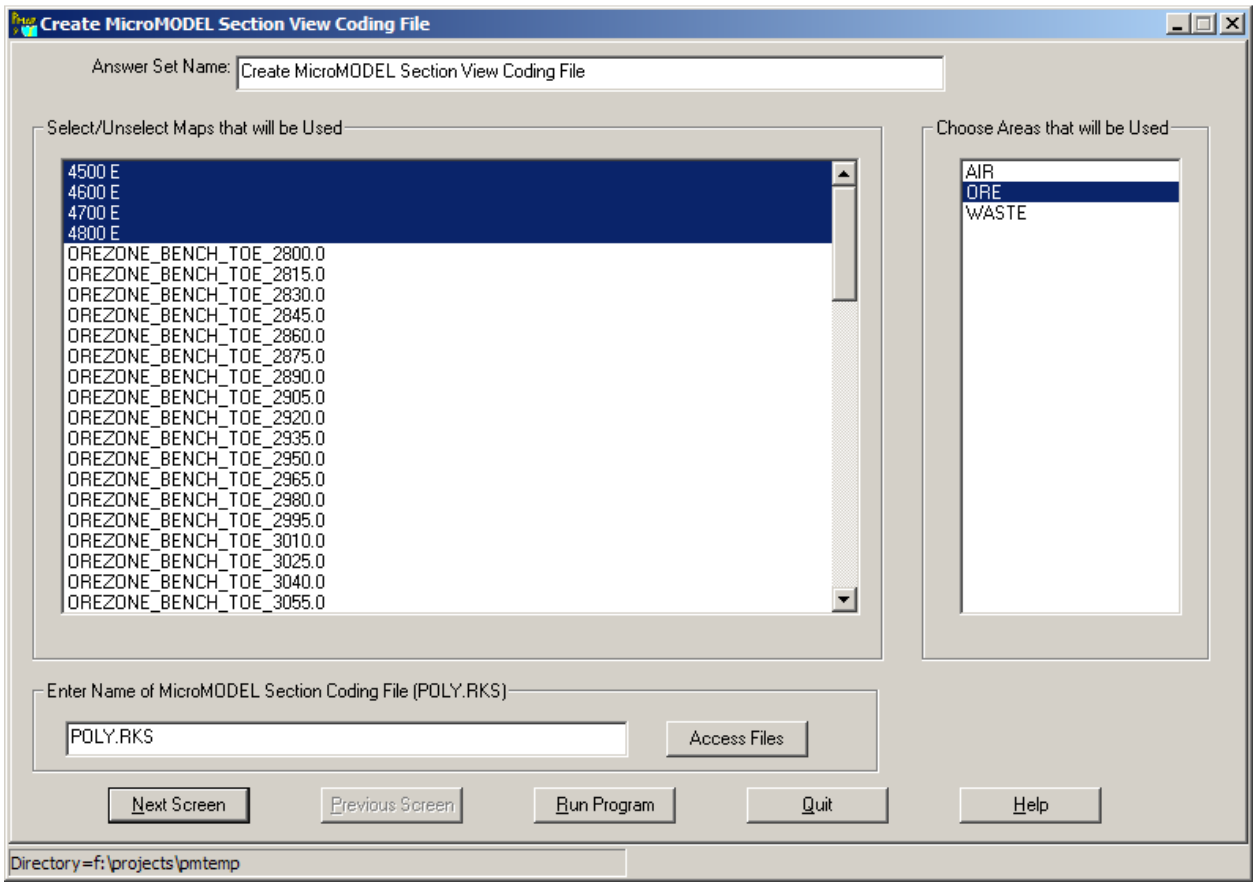


Figure 69 Create MicroMODEL Rock Coding File Screen 1

1) Select the maps to export in this file (4500E, 4600E, 4700E, and 4800E). Choose the areas to export. In this case, we are only interested in the ORE zones. Also, enter the name of the section coding file.

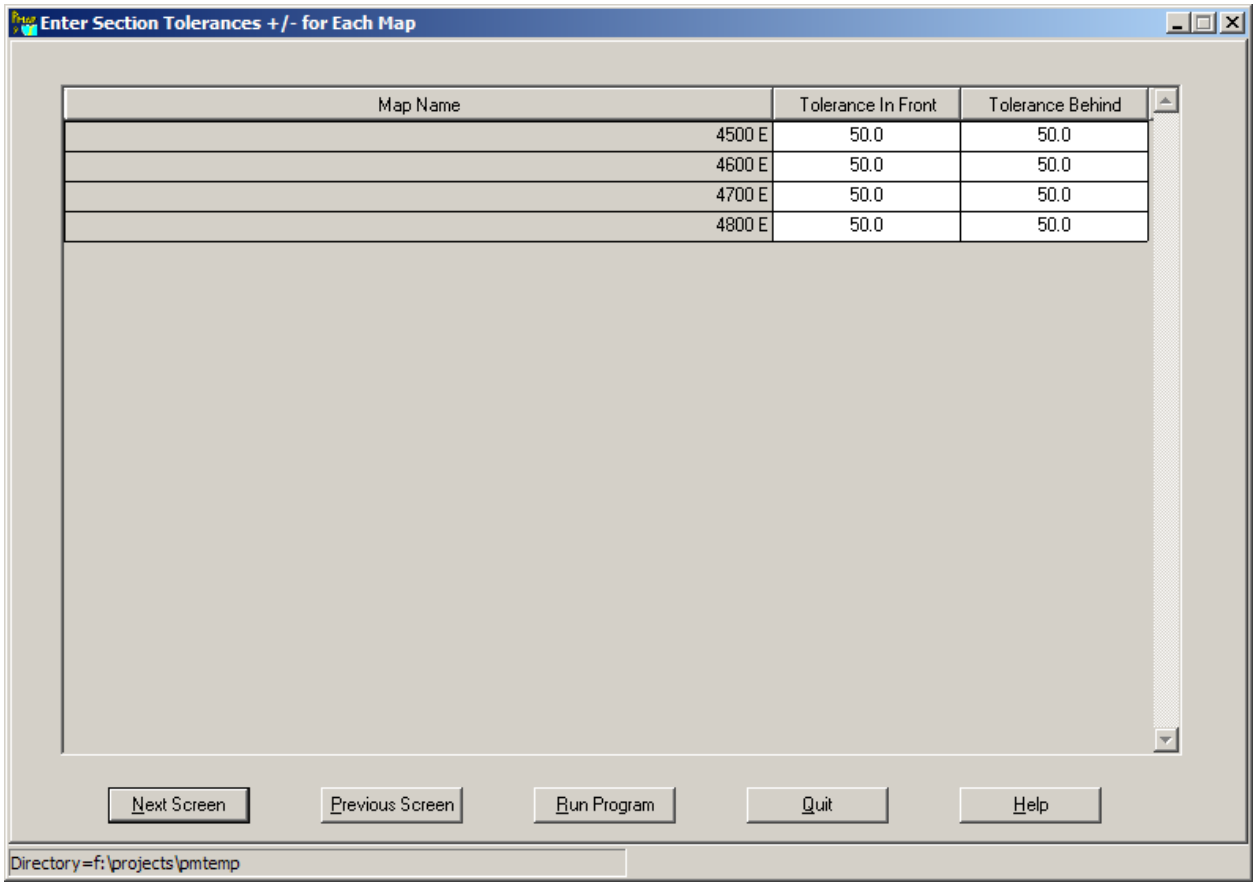


Figure 70 Create MicroMODEL Rock Coding File Screen 2

1) In this second screen, we enter the tolerance to use in front of and behind each of the sections. Since the sections are 100 feet apart, we use 50 feet tolerance for both.
2) Run the program. A short text output summary is generated:

```
PolyMap Geologic Modeling Software  -  Version 9.00
Project: PolyMap Demo Project


Create MicroMODEL Section View Coding File POLY.RKS


    AREA NAME               ROCK CODE

     ORE                          1
|
Process Map: 4500 E
Tolerance in Front =     50.0  Tolerance Behind =     50.0
     Writing polygon for rock code    1

Process Map: 4600 E
Tolerance in Front =     50.0  Tolerance Behind =     50.0
     Writing polygon for rock code    1

Process Map: 4700 E
Tolerance in Front =     50.0  Tolerance Behind =     50.0
     Writing polygon for rock code    1

Process Map: 4800 E
Tolerance in Front =     50.0  Tolerance Behind =     50.0
     Writing polygon for rock code    1
```

Figure 71 Create POLY.RKS File Summary Printout

1.34. Create a Wireframe of the Ore Zone

A wireframe model of the ore zone can be created with PolyMap. The zones that were outlined on each of the four sections can be joined together, making a more natural transition in the 3-D rock model. The same Geology Digitizing program is used, but with a new set of operating parameters.

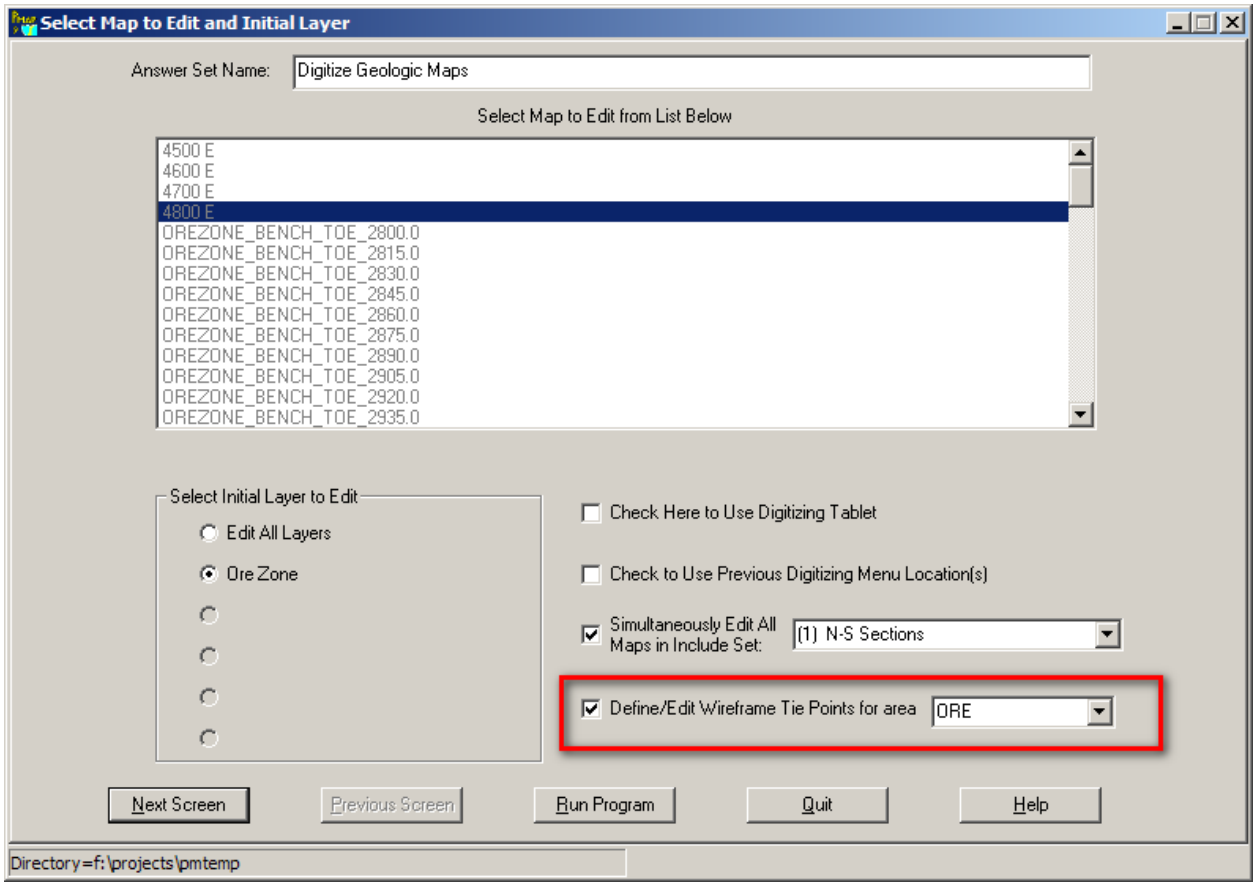


Figure 72 Define Wireframe Tie Points for ORE

The setup for defining wireframe tie points is the same as for digitizing the original zones, except that the "Define/Edit Wireframe Tie Points" box is checked, and we tell PolyMap we are defining them for the ORE zone. The following screen shows section 4800E before any tie lines have been added.

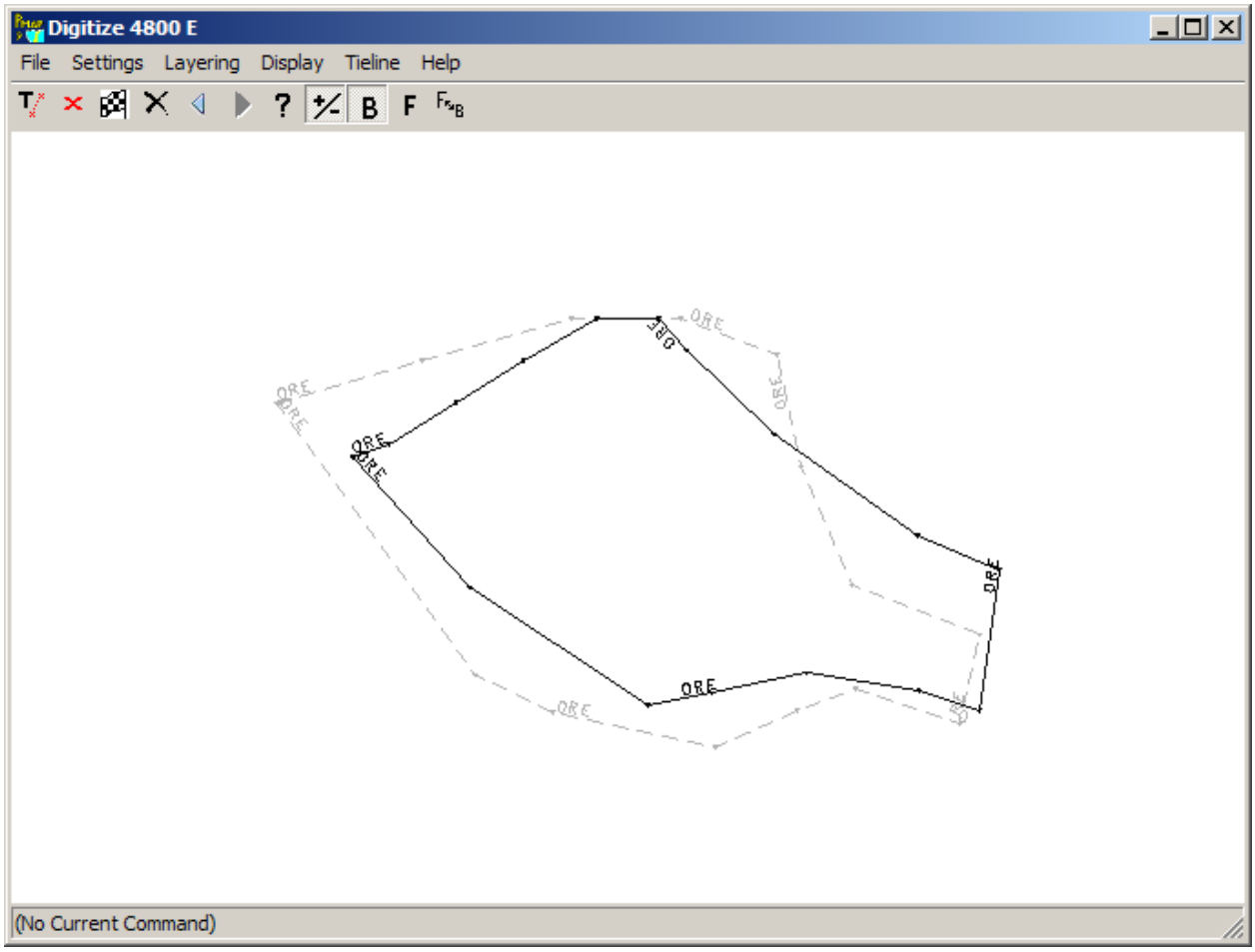


Figure 73 Section 4800E Before Tie Lines Added

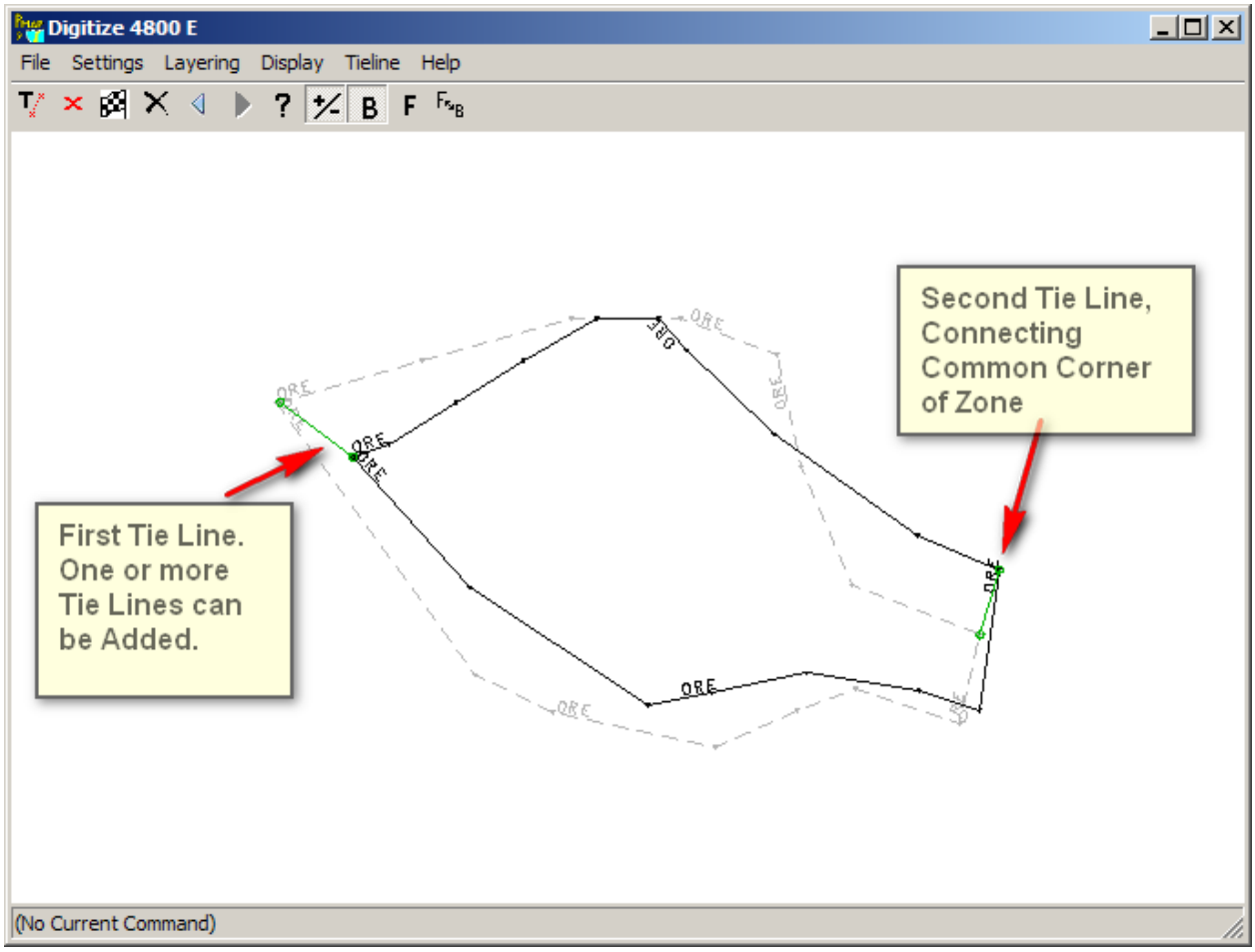


Figure 74 Screen Shot Showing Two Connecting Tie Lines

1) Zones are tied from section to section with one or more tie lines. Additional tie lines can be added to help create a more realistic transition.

For the “book end” sections, that is, the first and last sections, a special end cap tie line needs to be added. The cap will be the same shape as the zone polygon. It can be extended out a given distance, and can be shrunk to a smaller size, controlled by an input percentage. In the following dialog, an end cap is added which extends the zone out another 50 feet in front of the section, with no shrinkage.

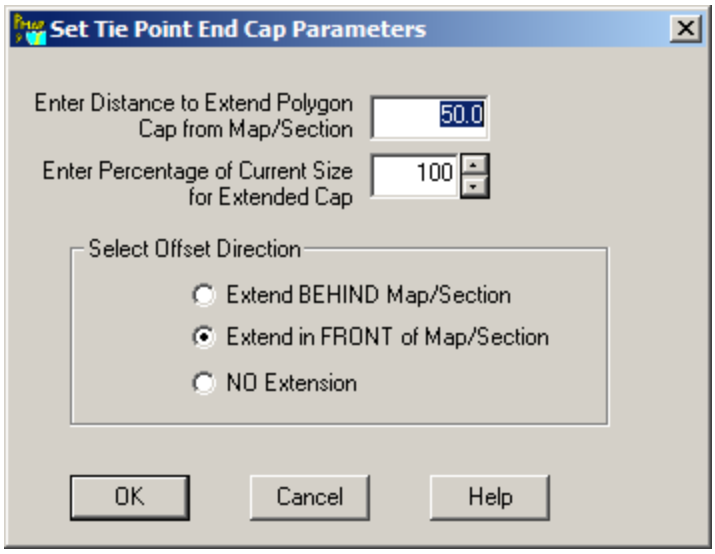


Figure 75 End Cap Tie Line Dialog

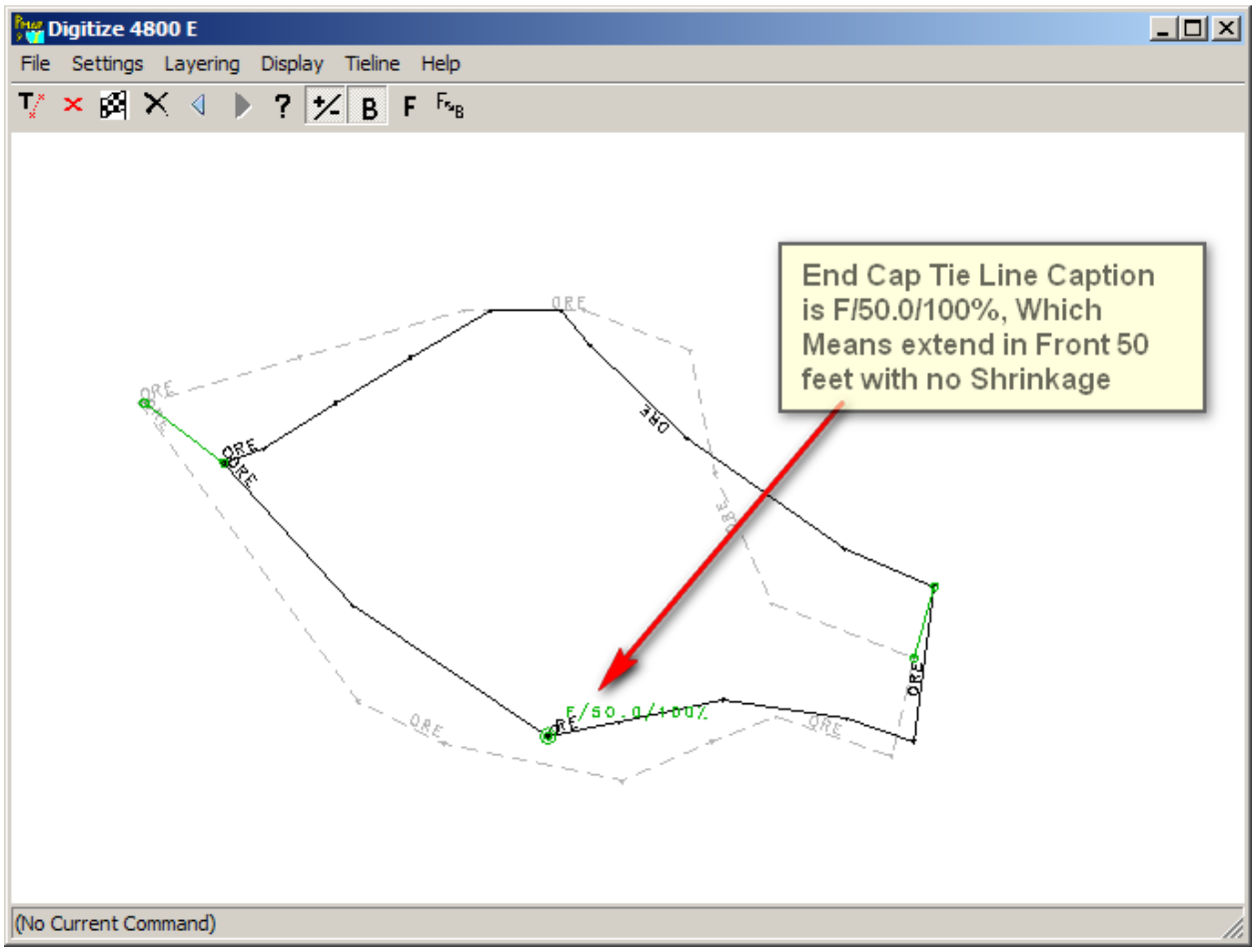


Figure 76 View of Added End Cap Tie Line

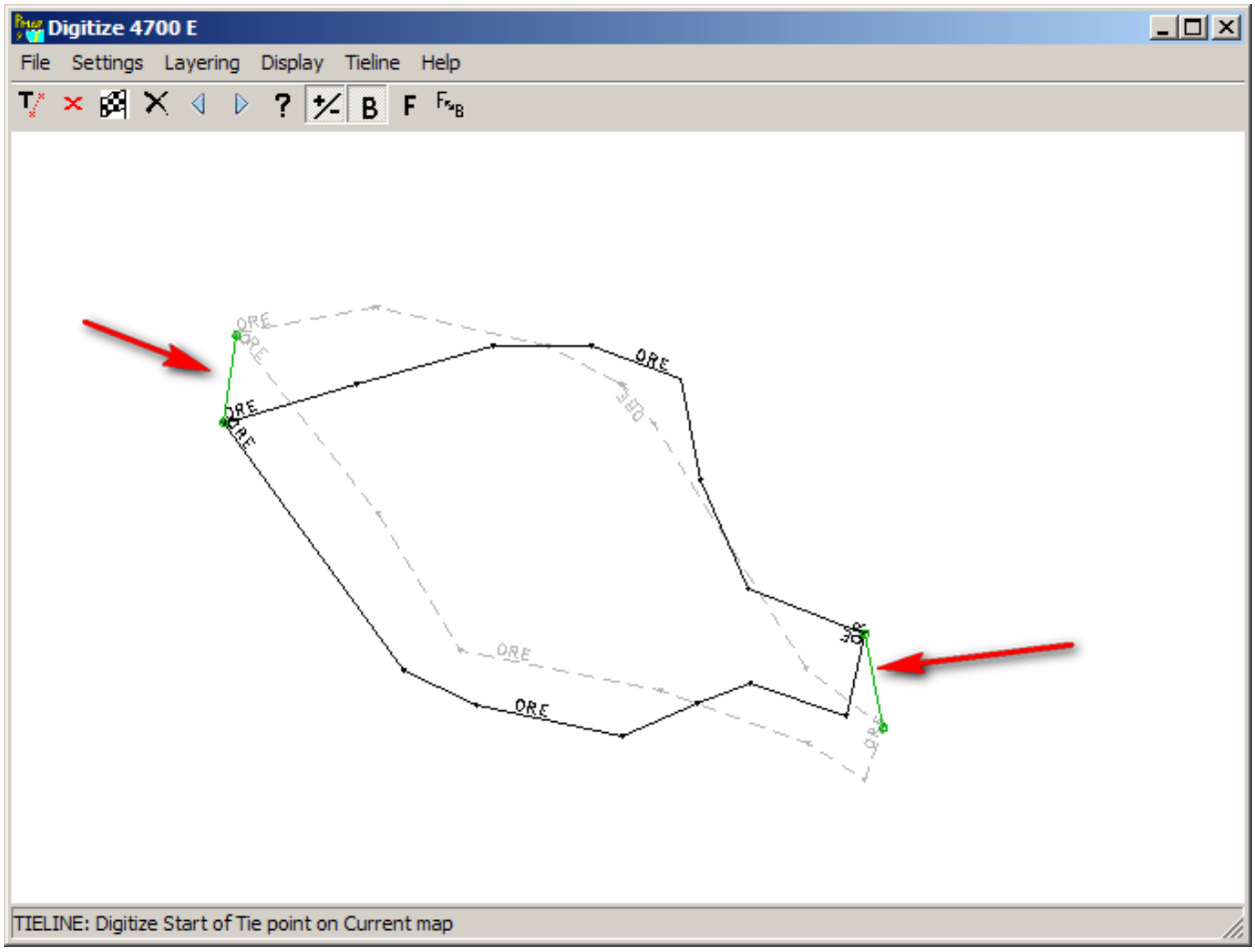


Figure 77 Tie Lines From 4700E to 4600E

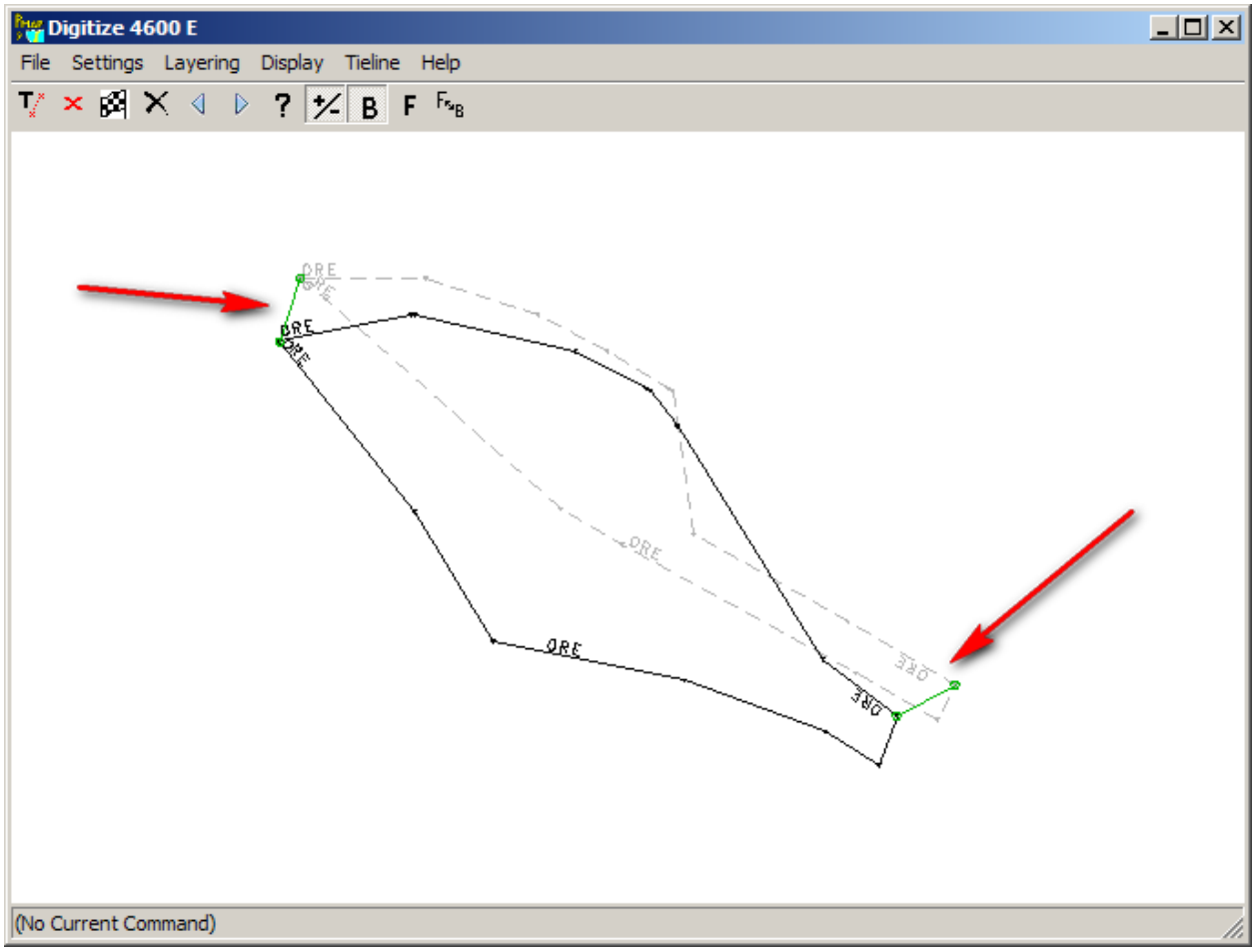


Figure 78 Tie Lines from 4600E to 4500E

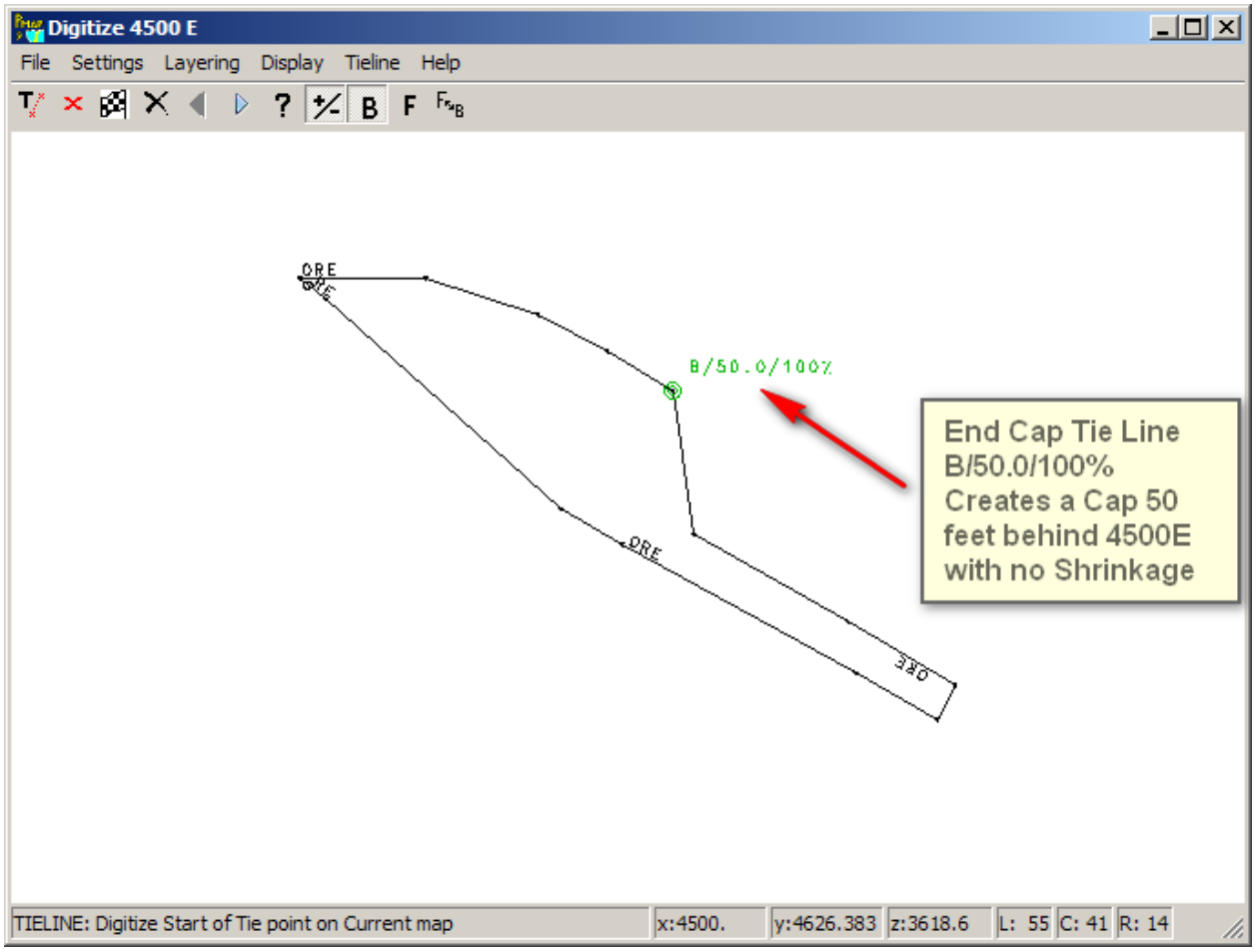


Figure 79 End Cap Tie Line for 4500E

After the tie lines have been added, tying our zones together and adding end caps, we can generate the actual wireframe. This is accomplished with Import/Export choice “Create Wireframe Model.” Use the following set of input values.

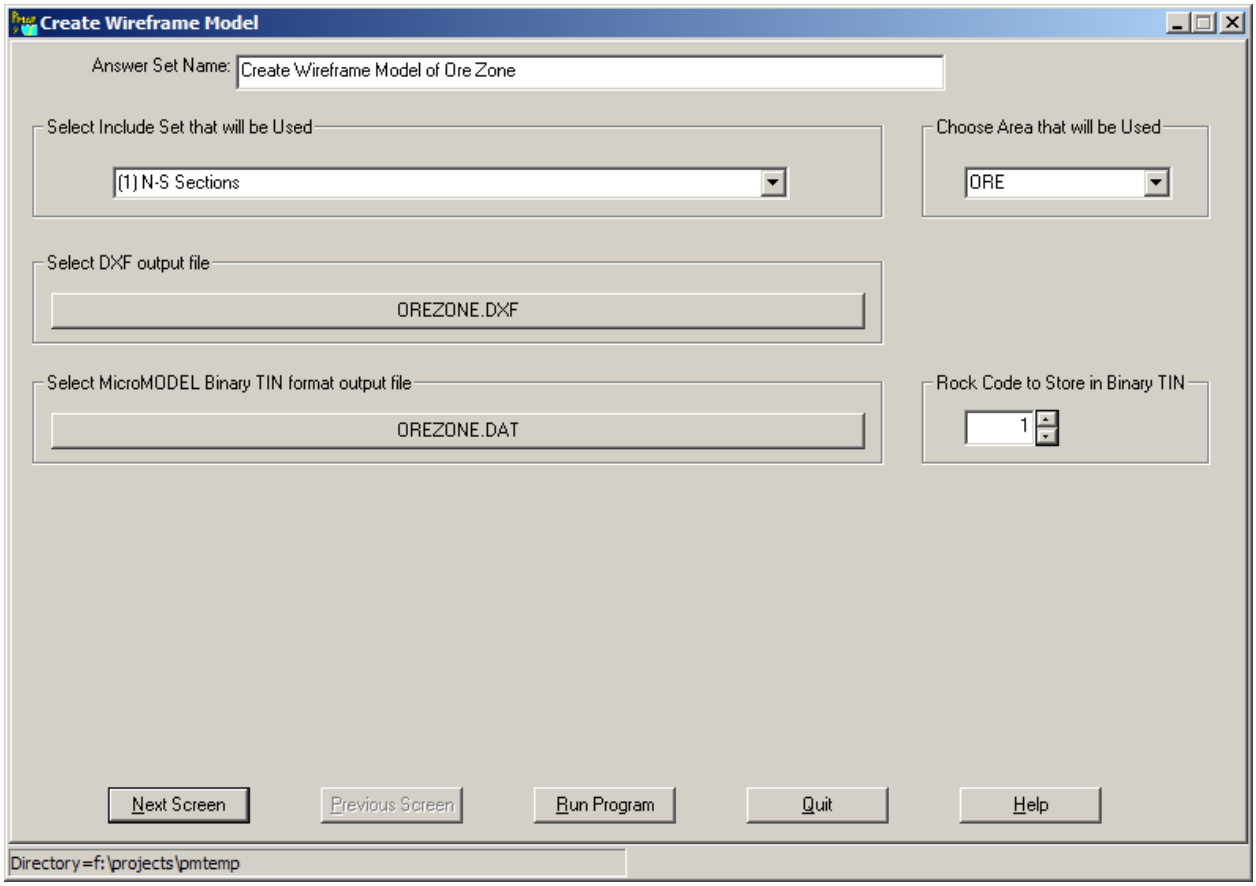


Figure 80 Create Wireframe Input Parameters

1) Be sure to select the correct include set. We want to create a wireframe for the N-S sections.
2) Choose the area to use. In this case, ORE.
3) Select a DXF and Binary TIN file name, and the rock code to store in the binary file. We choose code 1 here.
4) Run the program.

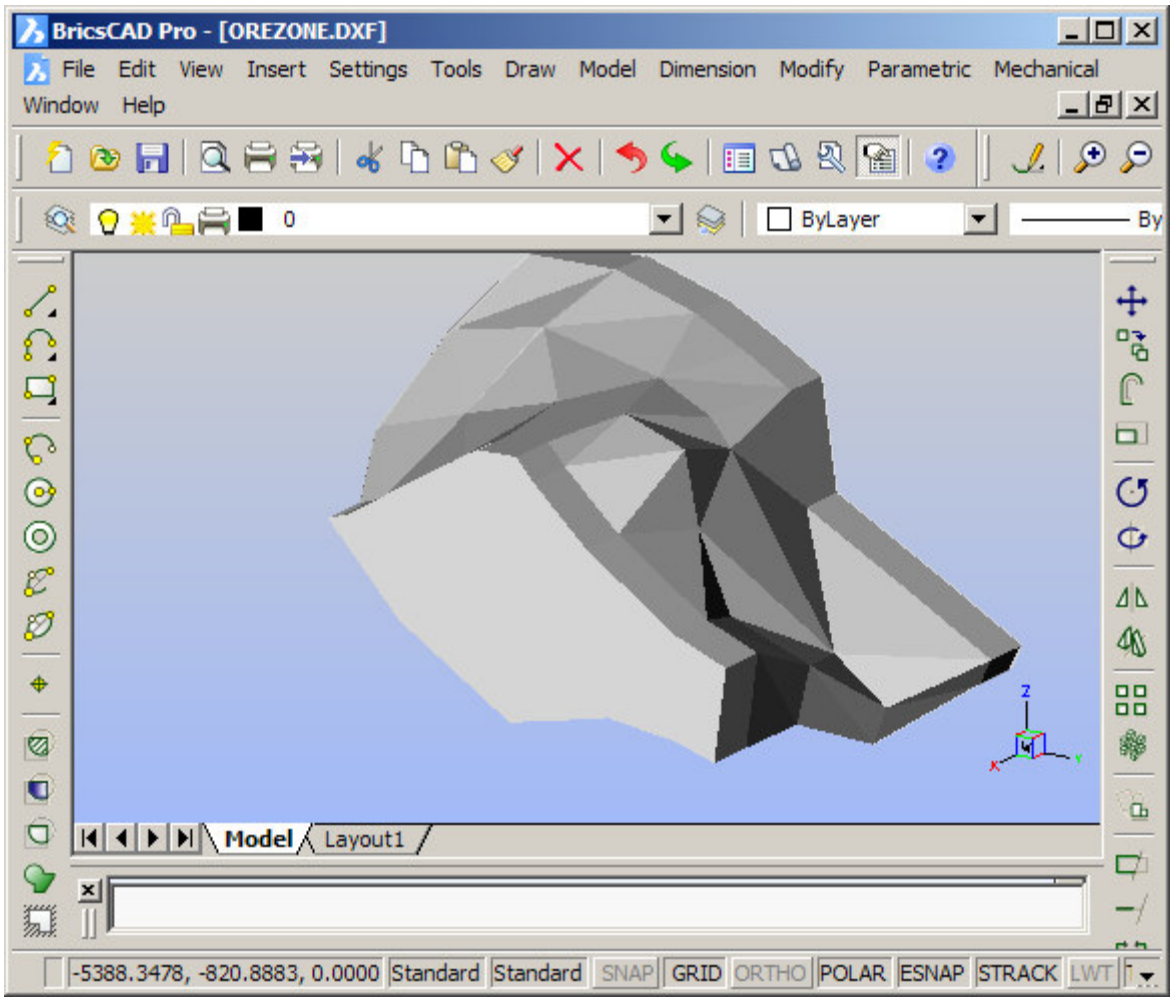


Figure 81 View of Wireframe DXF in BricsCAD

1) Here is the wireframe DXF shown in a CAD program display.