



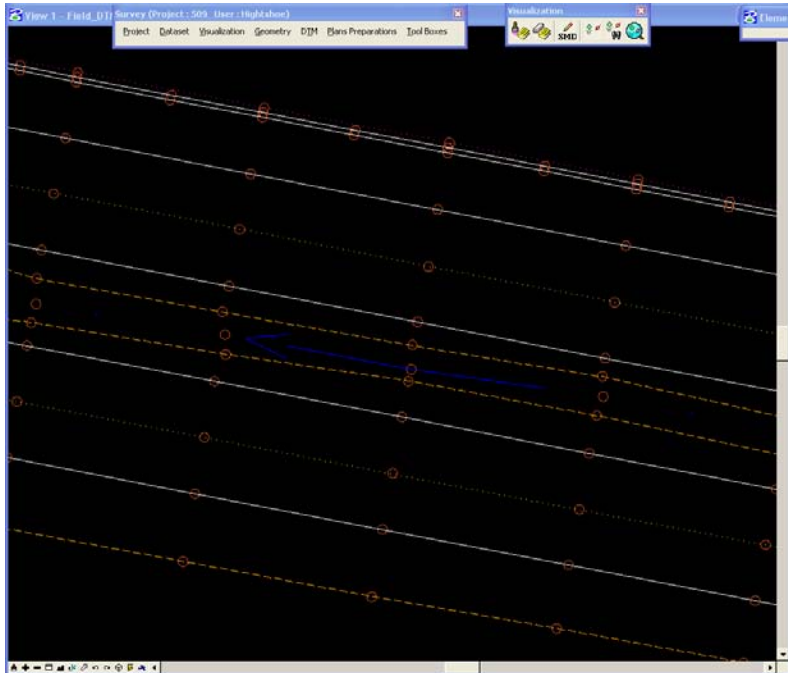
# Build DTM from Elements

Design Manual  
Chapter 40  
Design Survey  
Specifications

Originally Issued: 09-30-11

## DTM Model

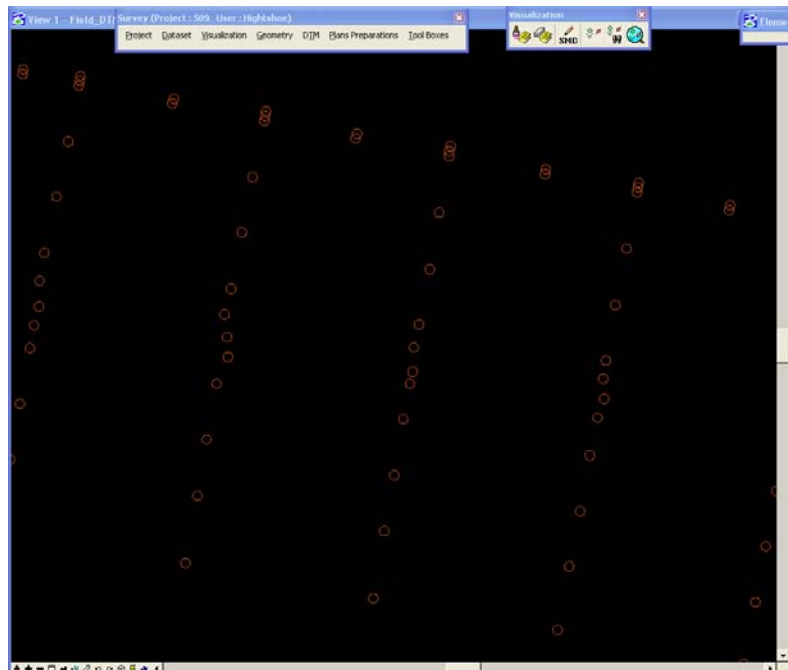
1.) Shown at the right is a zoomed-in picture of a **DTM model**. This model contains all survey elements classified as zone 2 or 3. This means that all of these elements are good for ground elevations. Because these items are drawn into a 3D MicroStation model, we can use these graphics to create a digital terrain model (**DTM**) or in GEOPAK terminology a triangulated model (**TIN**). Creating a TIN file in GEOPAK is a two-step process: creating a ".dat" file that contains all of the XYZ data from file, then converting this information into a TIN.



## Spot Shots

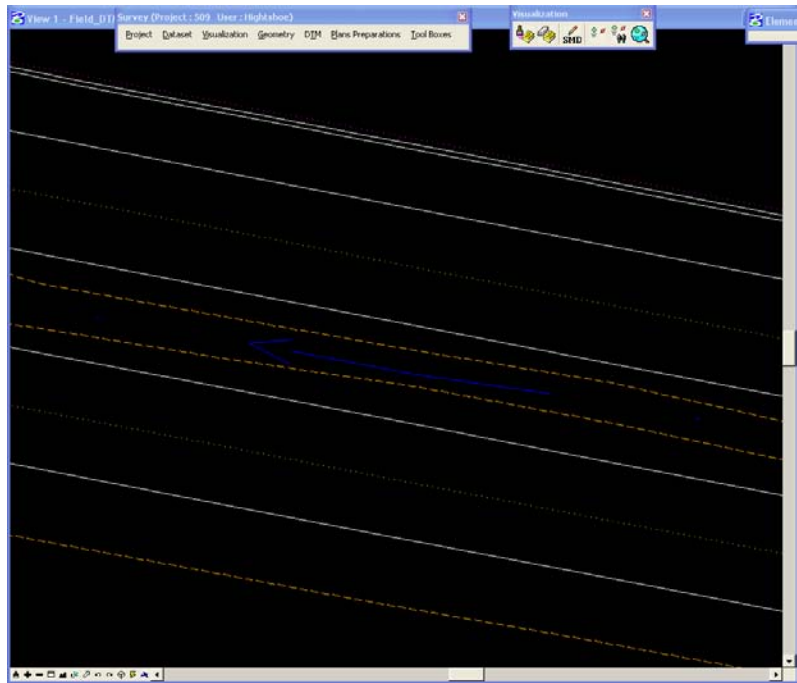
2.) All of the survey elements in this model belong to one of two groups.

The first of these groups includes the spot shots. These are the shot locations that are good for ground elevations. Each of the spot shots will represent the vertices of the triangles created in the TIN file. The spot shots will be drawn on multiple levels but will all be drawn with **color 62**, as shown at the right.



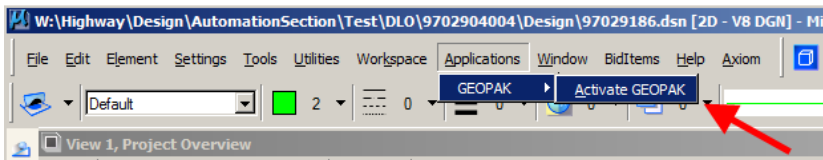
## Breaklines

3.) The second group includes breaklines. The breaklines are represented by survey chains that are good for ground elevations and drawn into this model. The breaklines do not allow triangle lines to cross them and they create a smoother and more accurate TIN file. Breaklines are drawn on multiple levels and colors due to the fact that they are used in other models also.

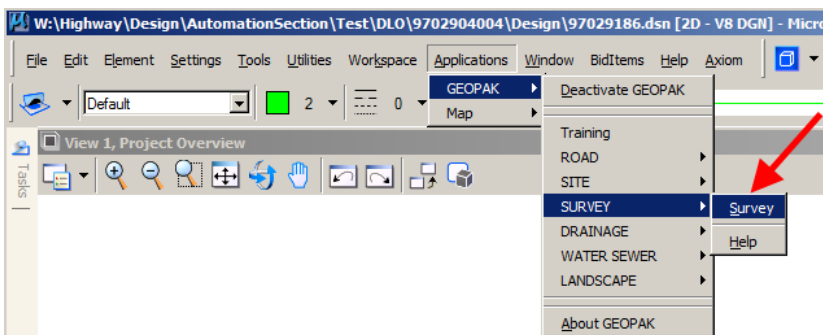


## Geopak Survey Menu

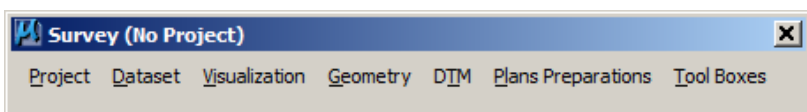
Start GEOPAK from the MicroStation menu by selecting **Applications > GEOPAK > Activate GEOPAK**, as shown at the right.



After GEOPAK has been activated, access the GEOPAK **Survey** menu from the MicroStation menu by selecting **Applications > GEOPAK > SURVEY > Survey**, as shown at the right.

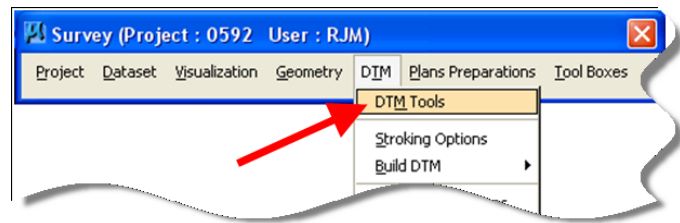


The **Survey** menu should display, as shown at the right.

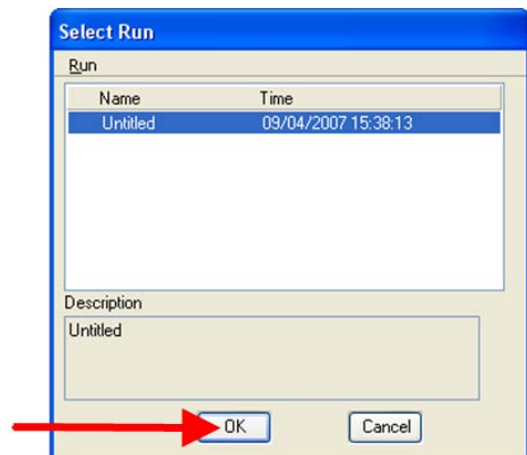


## The “.dat” file

4.) To begin the process, we will build a “dat” file. Select **DTM > DTM Tools** from the **Survey** tool bar. This should open the **DTM** tool bar, as shown in #6 below. If not, go to step #5.

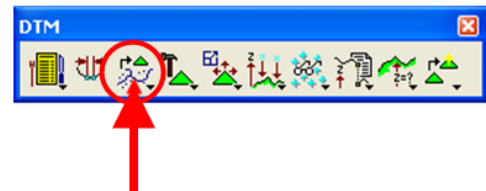



5.) If the **Select Run** dialog is present, *click* the **OK** button and the **DTM** toolbar should now appear.

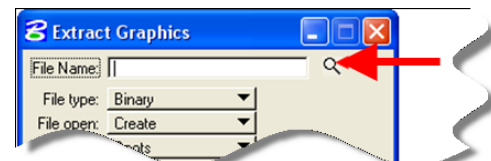


## Extract Graphics

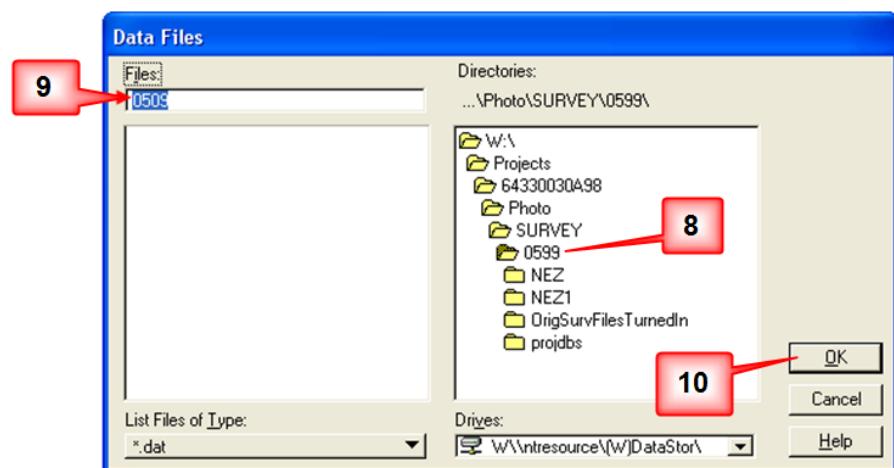
6.) On the **DTM** tool bar, *click* the **Extract Graphics** button, located third icon from the left. This will open the **Extract Graphics** dialog, as shown below.



7.) On the **Extract Graphics** dialog, *click* the “Magnifying Glass” **Browse** icon (  ) to open the **Data files** dialog box.



8.) In the **Data Files** dialog, confirm that the directory and folder shown on the right side are correct. If the **GEOPAK Survey** project has been selected previously, it should still be set correctly at this time.



9.) Type in the **SAP#**, (**S**urvey **A**nd **P**hotogrammetry **N**umber), for the file you are about to create.

10.) After everything has been entered correctly and verified, *click* the **OK** button.

11.) In the **Extract Graphics** dialog box, the **File Type** should be **Binary**.

12.) **File Open** should be set to **Create**.

13.) Set the **Feature** to **Spots**.

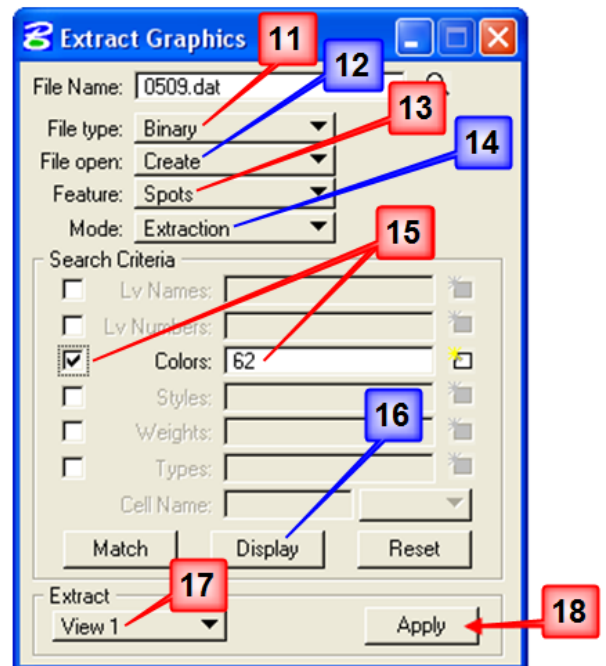
14.) The **Mode** should be set to **Extraction**.

15.) Place a check mark (☑) next to **Colors** and then enter **62** for the color number.

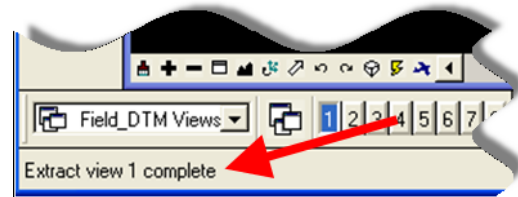
16.) To verify that all of the spot shots are being selected, you can use the **Display** button to *highlight* and *un-highlight* the items. You can also turn the MicroStation levels **ON** and **OFF** to better see what is being selected.

17.) Under **Extract**, make sure the selection is set to **View 1**. This tells GEOPAK to extract all of the spot shots that are showing in your MicroStation window. Use the MicroStation view tools such as **Fit View** and **Zoom Out** to ensure that all points that you want extracted are showing in the window.

18.) After everything is set correctly, *click* the **Apply** button.



19.) When GEOPAK has completed extracting all of the spot shots, it will show that the operation is complete by the message in the lower left corner of the MicroStation window.

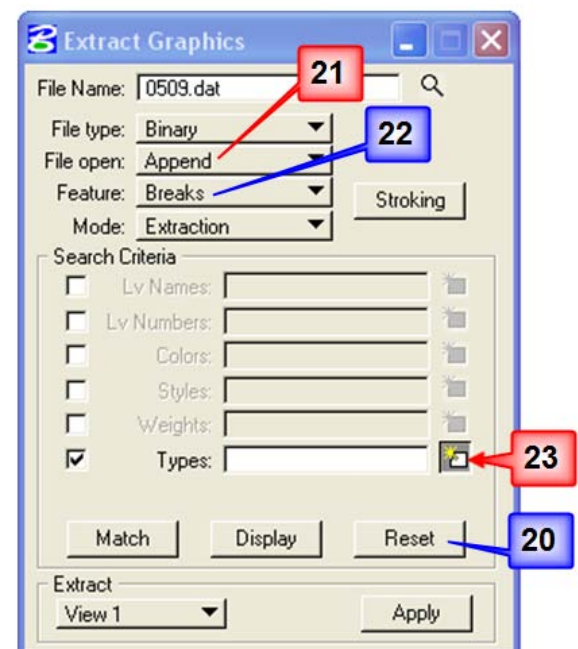


20.) The breaklines can now be extracted from the file. *Click* the **Reset** button on the **Extract Graphics** dialog to clear the **Colors** field.

21.) We have already created the (example) file **0509.dat** when we extracted the spot shots. We now want to add the breakline information to the same file. Change the **File Open** option to **Append**.

22.) Change the **Feature** to **Breaks**.

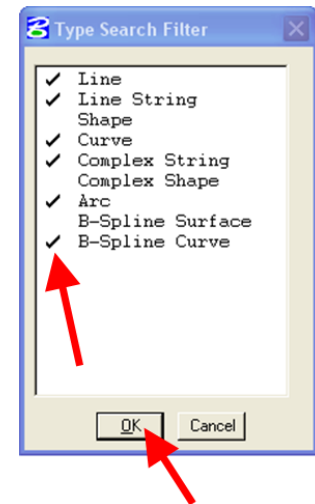
23.) Place a **check mark** next to **Types** and then *click* the **Select Element Types** button.



24.) In the **Type Search Filter** dialog, shown at the right, place a **check mark (✓)** next to

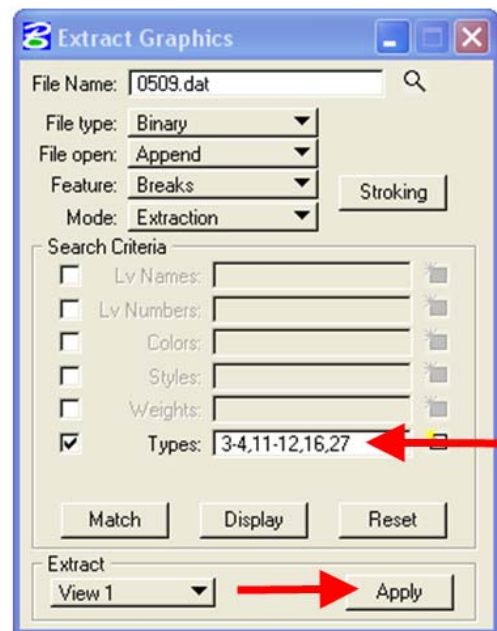
**Line,**  
**Line String,**  
**Curve,**  
**Complex String,**  
**Arc,** and  
**B-Spline Curve.**

Click the **OK** button next.

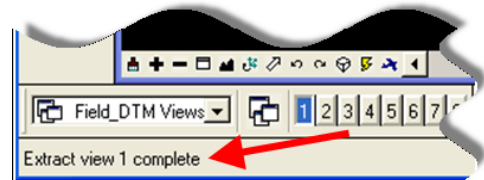


25.) The numbers representing the “types”, selected above, will now be shown in the **Types** field of the **Extract Graphics** dialog, as shown at the right.

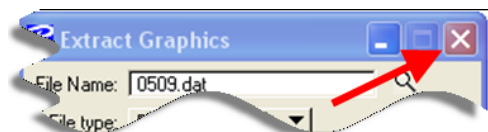
26.) **View 1** is being used as the **Extract** boundary so make sure that everything is showing in the MicroStation **View 1** window. Click the **Apply** button to **extract** the breaklines.



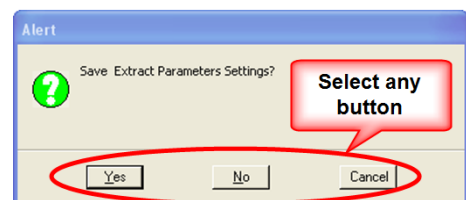
27.) When the extraction process is complete, MicroStation will display the “**Extract view 1 complete**” message in the lower left corner of the MicroStation window, as shown at the right.



28.) The **Extract Graphics** dialog can now be closed by *clicking* on the “**X**” in the upper right corner.

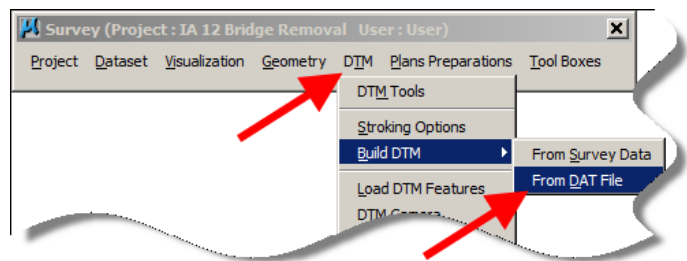


After clicking the “**X**”, an **Alert** box will “ask” if you want to “**Save Extract Parameters Settings?**”, which are the settings shown in the of the **Extract Graphics** dialog. You can select (*click*) any of the buttons, as this has no effect on the “**dat**” file that was created.

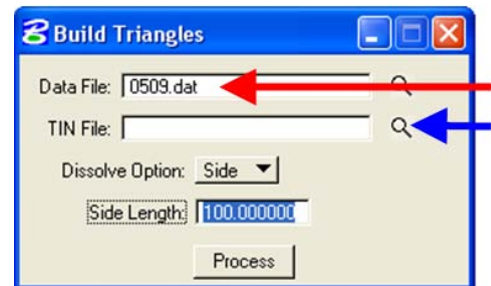


## The TIN file

29.) The “.dat” filename (0509 in this example) will correspond to your project **SAP** number. File **0509.dat** is now complete. The file contains all of the XYZ data necessary to build a **TIN** from the spot shots and breaklines. The **TIN** will now be created from this file. From the **Survey** tool bar, select **DTM > Build DTM > From DAT File**, as shown at the right. This will open the **Build Triangles** dialog.

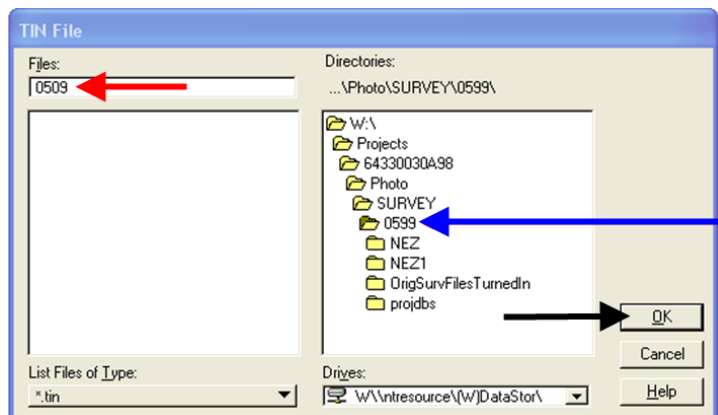


30.) In the **Build Triangles** dialog, confirm that the **Data File** field contains the same “.dat” file name as the one just created. If it doesn't, *click* on the **Data File** Magnifying Glass icon (🔍) and select the correct one.



31.) In the **TIN** file field, *click* the Magnifying Glass **Browse** icon (🔍), as located by the blue arrow, to select the name of the **TIN** file that is about to be created.

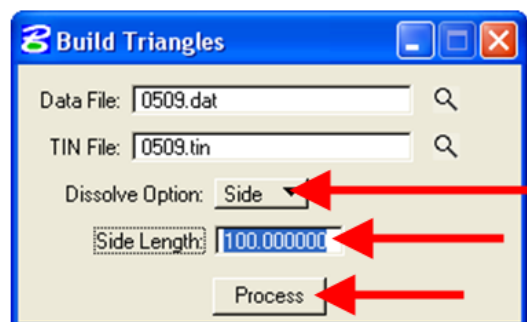
32.) In the **TIN File** dialog, make sure the correct folder is chosen in the **Directories** window, shown by the blue arrow at the right.



33.) Enter the **SAP** number as the *name* of the **TIN** file, as shown by the red arrow.

34.) *Click* the **OK** button, shown by the black arrow.

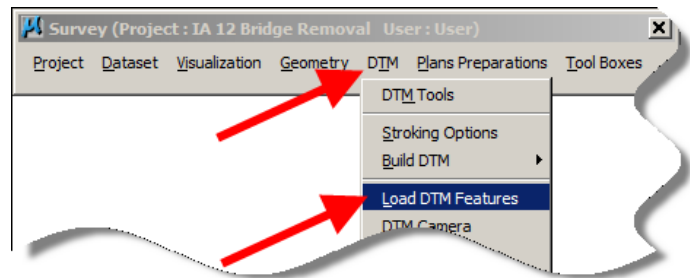
35.) As shown in the **Build Triangles** dialog at the right, *select* **Side** for the **Dissolve Option**.



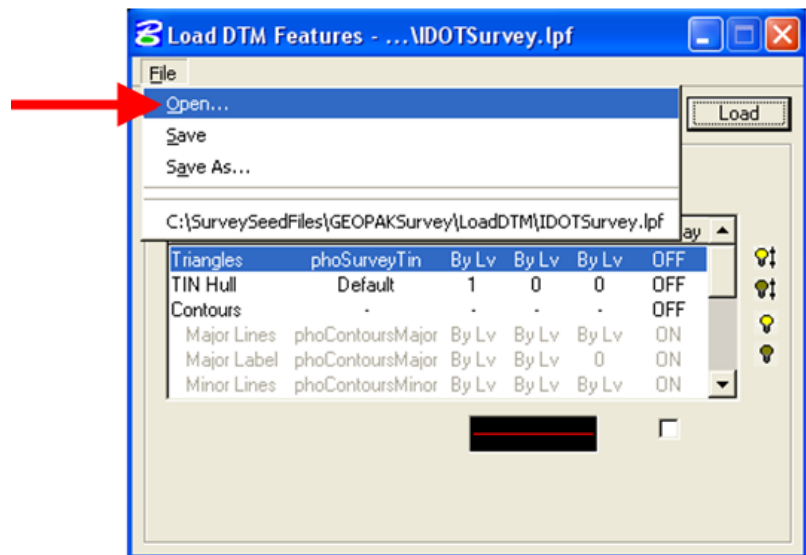
36.) Enter the value of **100** for the **Side Length**. This number represents the maximum length of any side of the triangles about to be created in the TIN file. You can adjust this number to eliminate as many unwanted exterior triangles as possible.

37.) When complete, *click* the **Process** button.

38.) To view the **TIN** file that you just created, select **DTM > Load DTM Features** from the **Survey** tool bar, as shown at the right. This will open the **Load DTM Features** dialog.



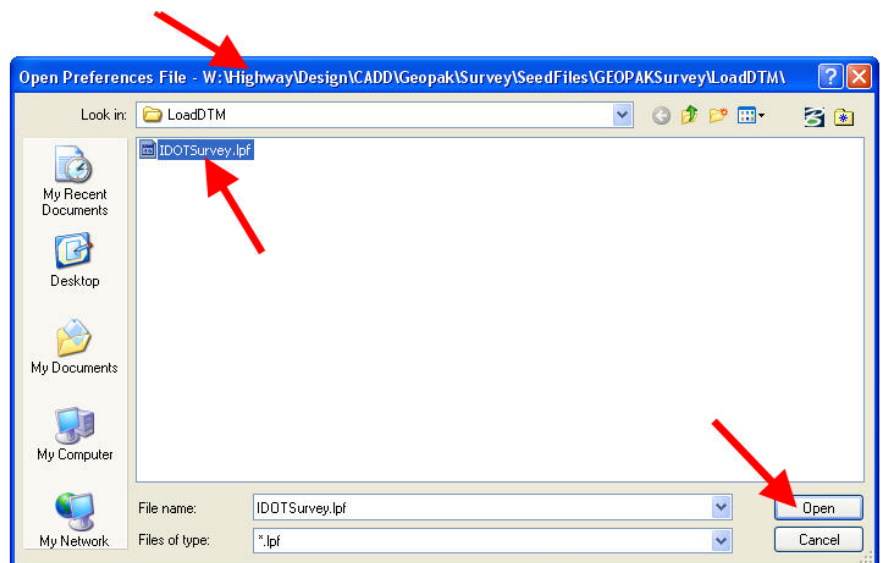
39.) On the **Load DTM Features** dialog, select **File > Open**, as shown at the right. This will open the **Open Preferences File** dialog, as shown below.



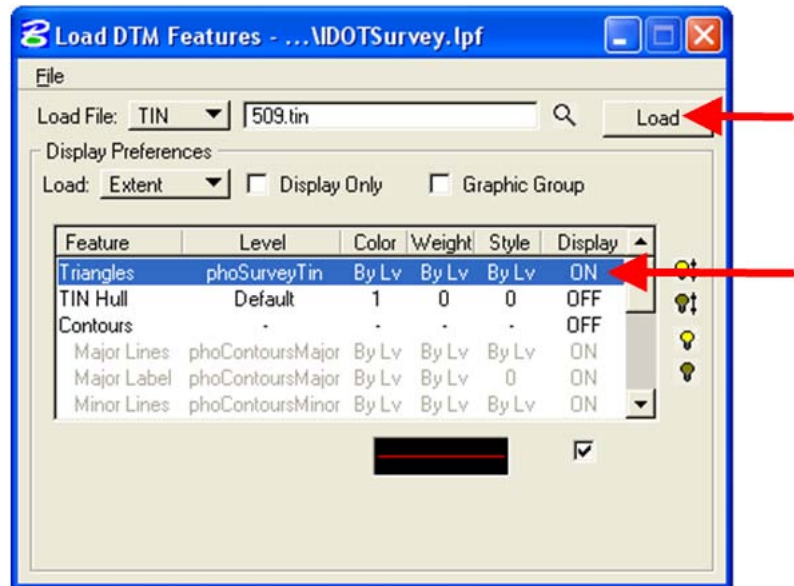
40.) In the **Open Preferences File** dialog, navigate to the following location:

**W:\Highway\Design\CADD\Geopak\Survey\SeedFiles\GEOPAKSurvey\LoadDTM**, as shown at the right.

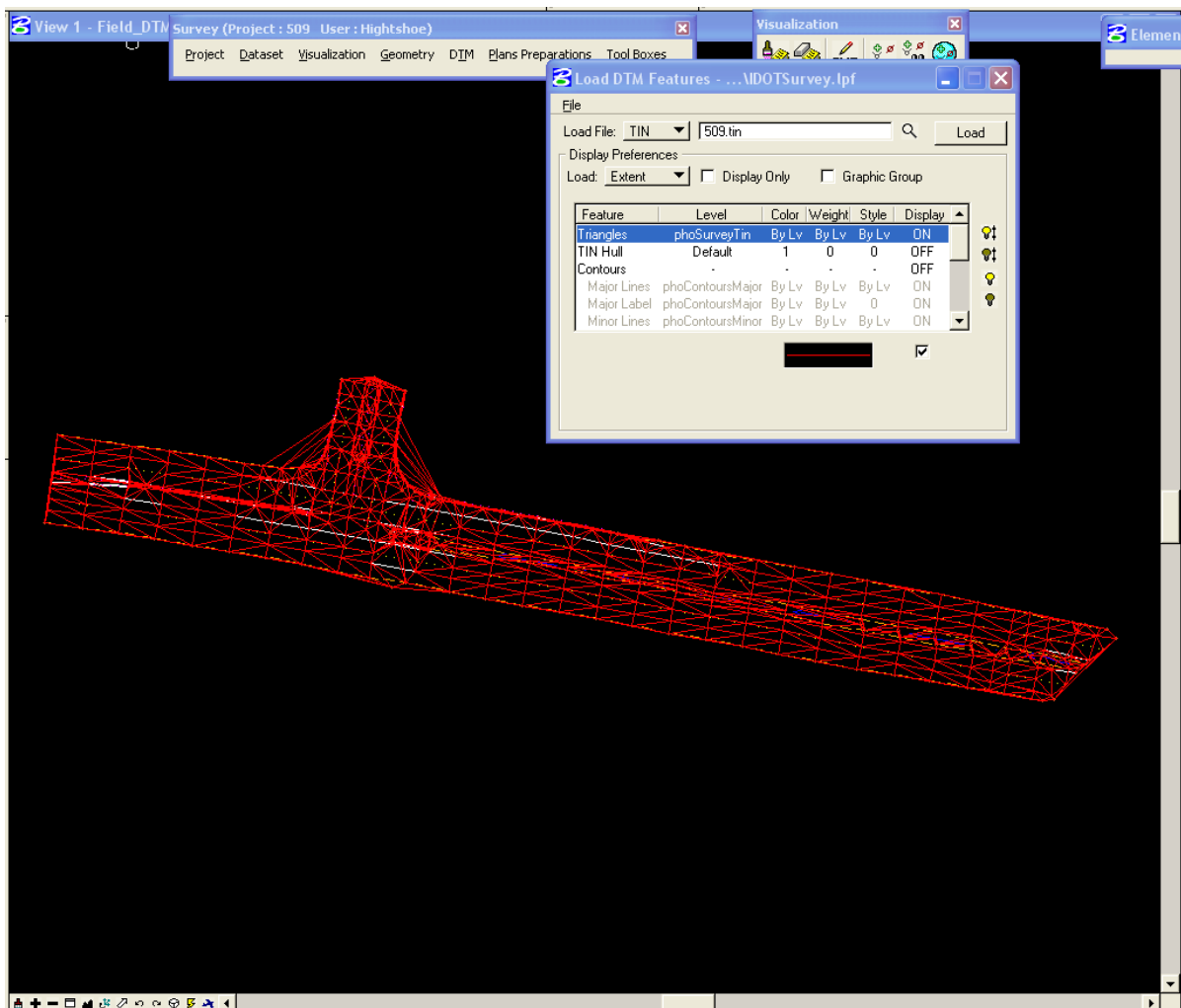
41.) Select file **IDOTSurvey.lpf** and then **click** the **Open** button.



42.) All of the default drawing settings should now be set in the **Load DTM Features** dialog. The **Display ON/OFF** setting should be **ON** for the **Triangles** feature, and **OFF** for everything else. This can be accomplished by *double-clicking* on each item to reverse its setting or by *clicking* the “light bulb” icons (💡) at the right. When all settings are correct, *click* the **Load** button and the triangles will be drawn into the file.



43.) The triangulated surface should appear similar to the following.





# Chronology of Changes to Design Manual Section:

## 040D-008 Build DTM from Elements

9/30/2011	NEW
	New