3. DTM Drainage Tools

GEOPAK supports a wide range of tools that allows you to analyze and evaluate the drainage patterns of a GEOPAK Digital Terrain Model or TIN file. These tools are useful for delineating and distinguishing watersheds, flow paths, flow directions, and hydrographic features.

This exercise allows the user to become familiar with the Digital Terrain Model (or DTM) Drainage Tools.

See Exercise 22 in the TDOT GEOPAK Road Course Guide for guidance in creating a final merged TIN file.

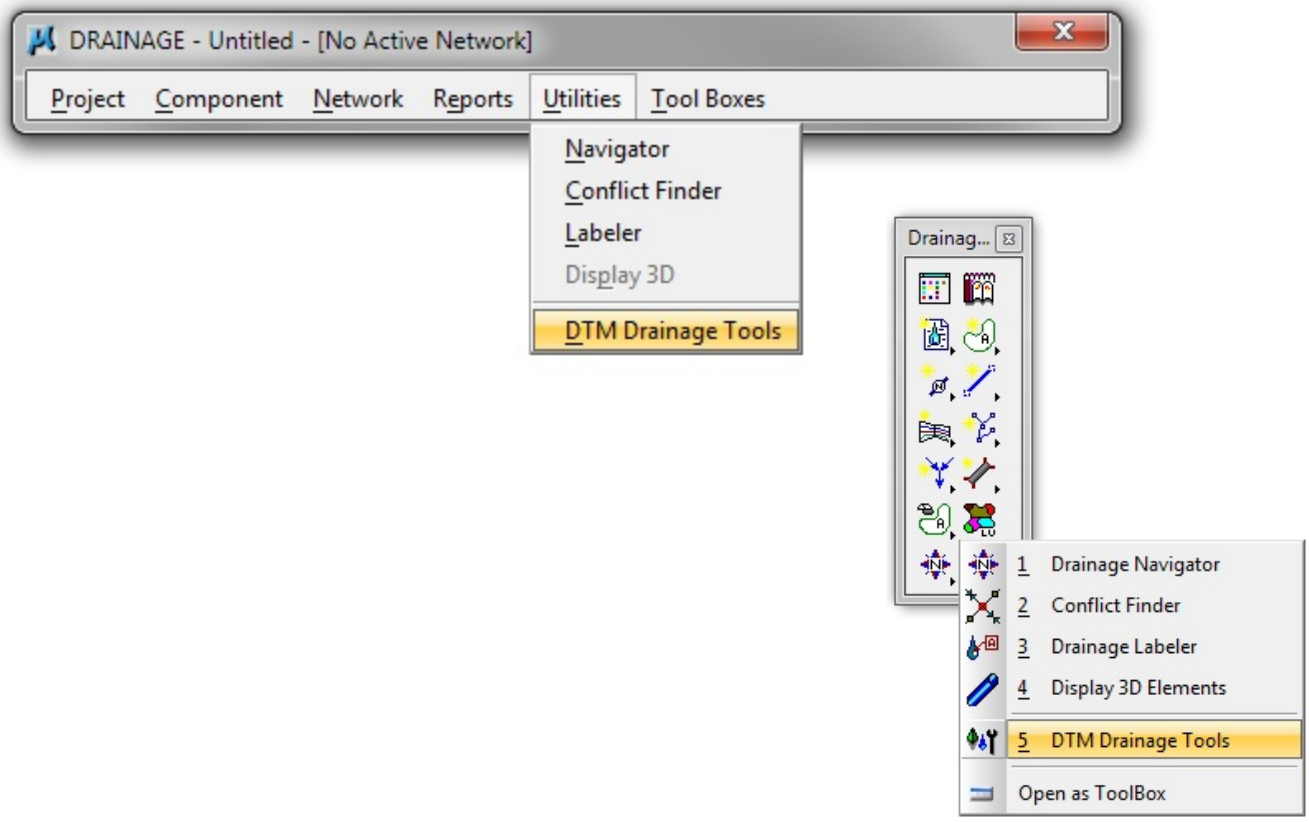
3.1 Accessing DTM Drainage Tools

a) Open the file **DVSR1proposed.dgn file**.

Note: The landuse.dgn file has already been referenced into this file for your use. Refer to the previous exercise (Exercise 2) or to the Land Use DGN Creation document for instructions on creating the land use file.

b) Open GEOPAK Drainage and select from the Drainage Menu Bar:

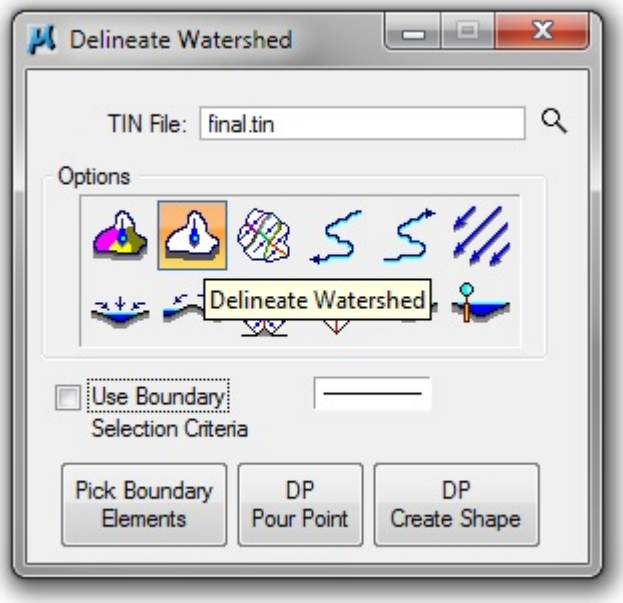
Utilities > DTM Drainage Tools



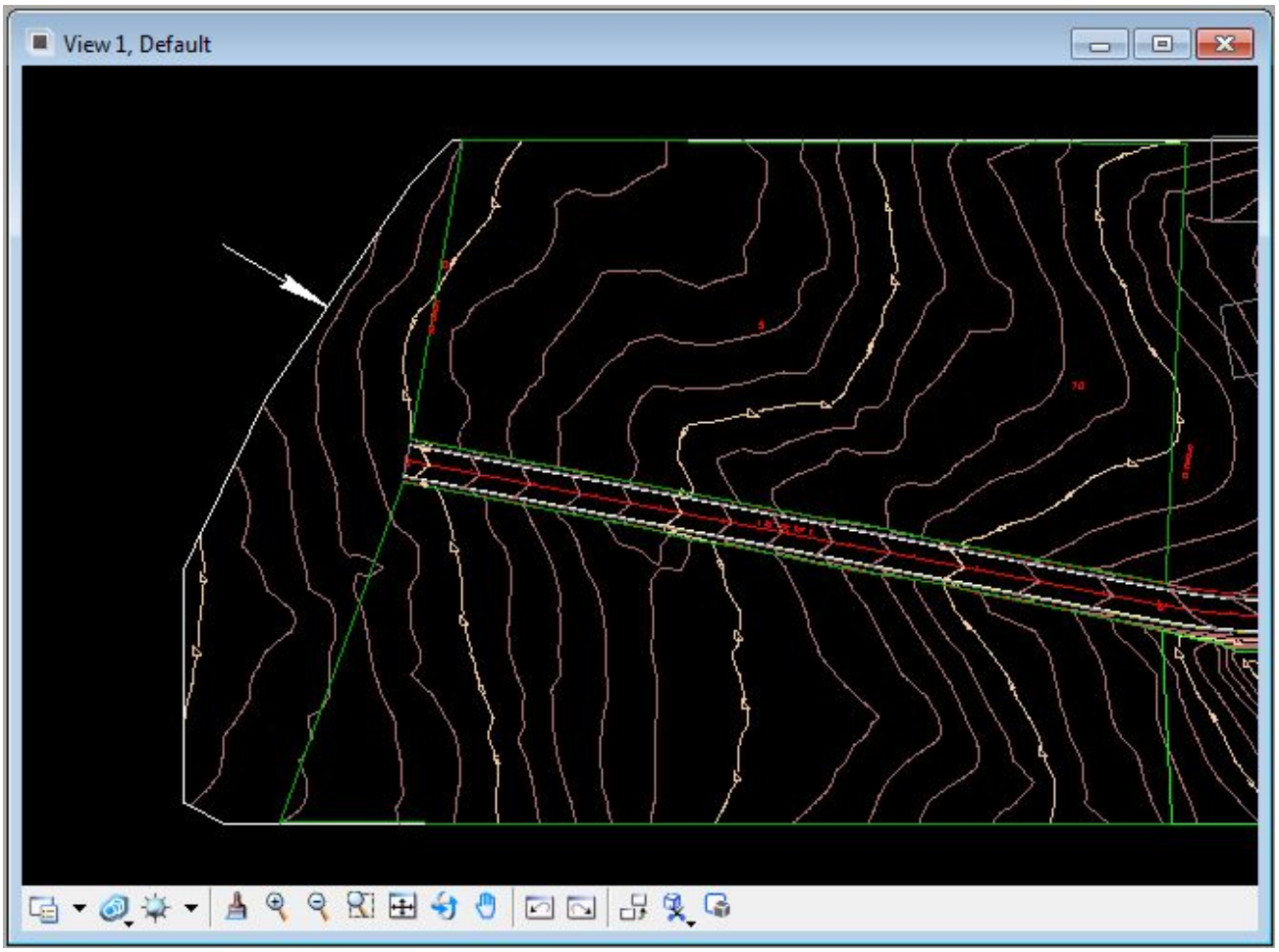
3.2 Delineate Watershed

The Delineate Watershed tool outlines and defines a watershed at any location within the TIN surface. The pour point of the watershed is the most downstream point of a desired watershed. Once a data point representing the pour point of the watershed is indicated the contributing watershed area is computed and delineated. Pour points must be located near sumps (i.e. low points) in the terrain since a point lying on the side of a hill does not actually have a contributing area.

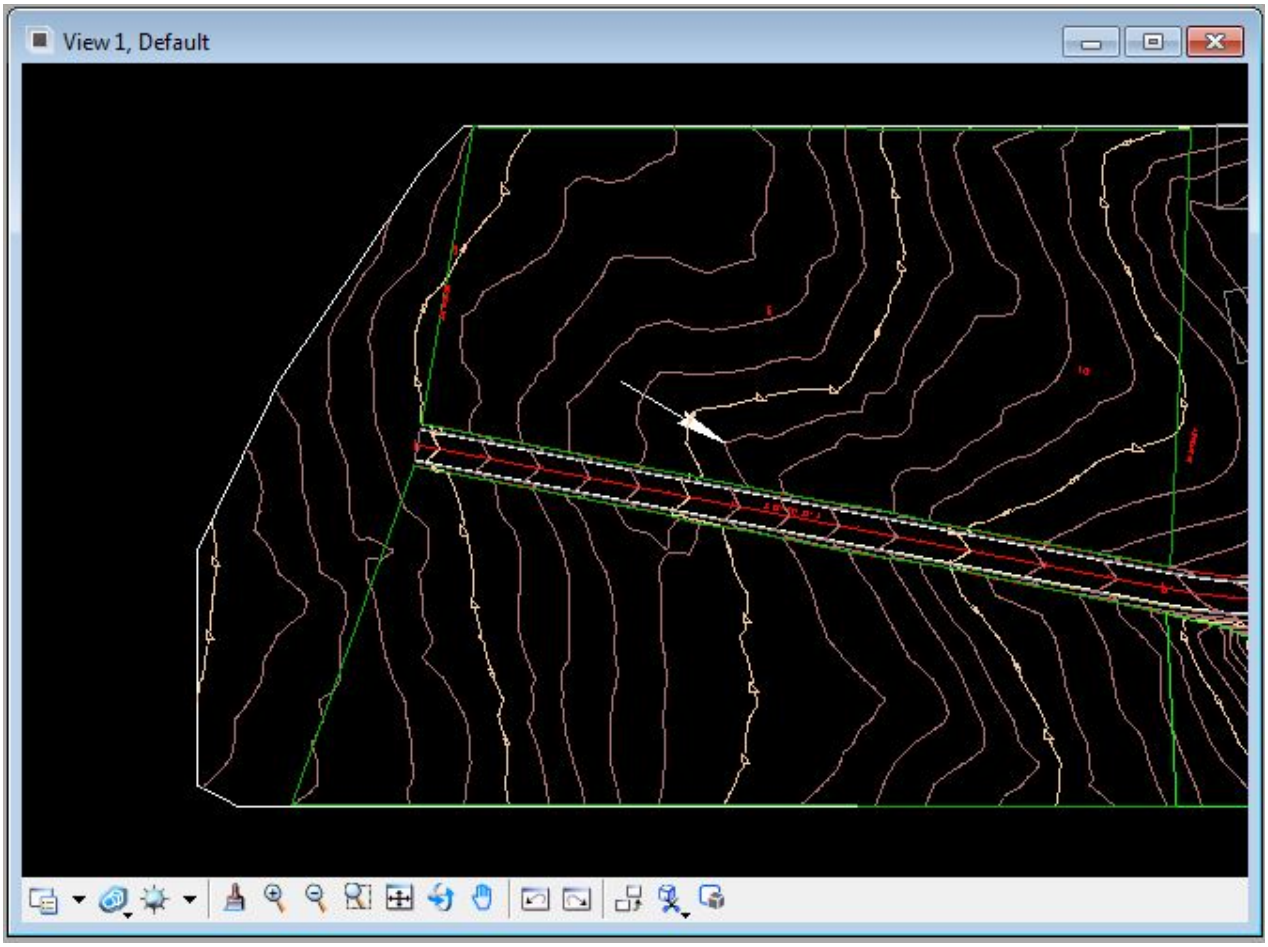
a) Use the Select File button to select the final merged TIN for the project. Then select the DTM Drainage Icon **Delineate Watershed**.



b) Click the **Pick Boundary Elements** button and select the element representing the tin hull (the boundary of the TIN file) as shown in the screenshot below. Data Point to accept.

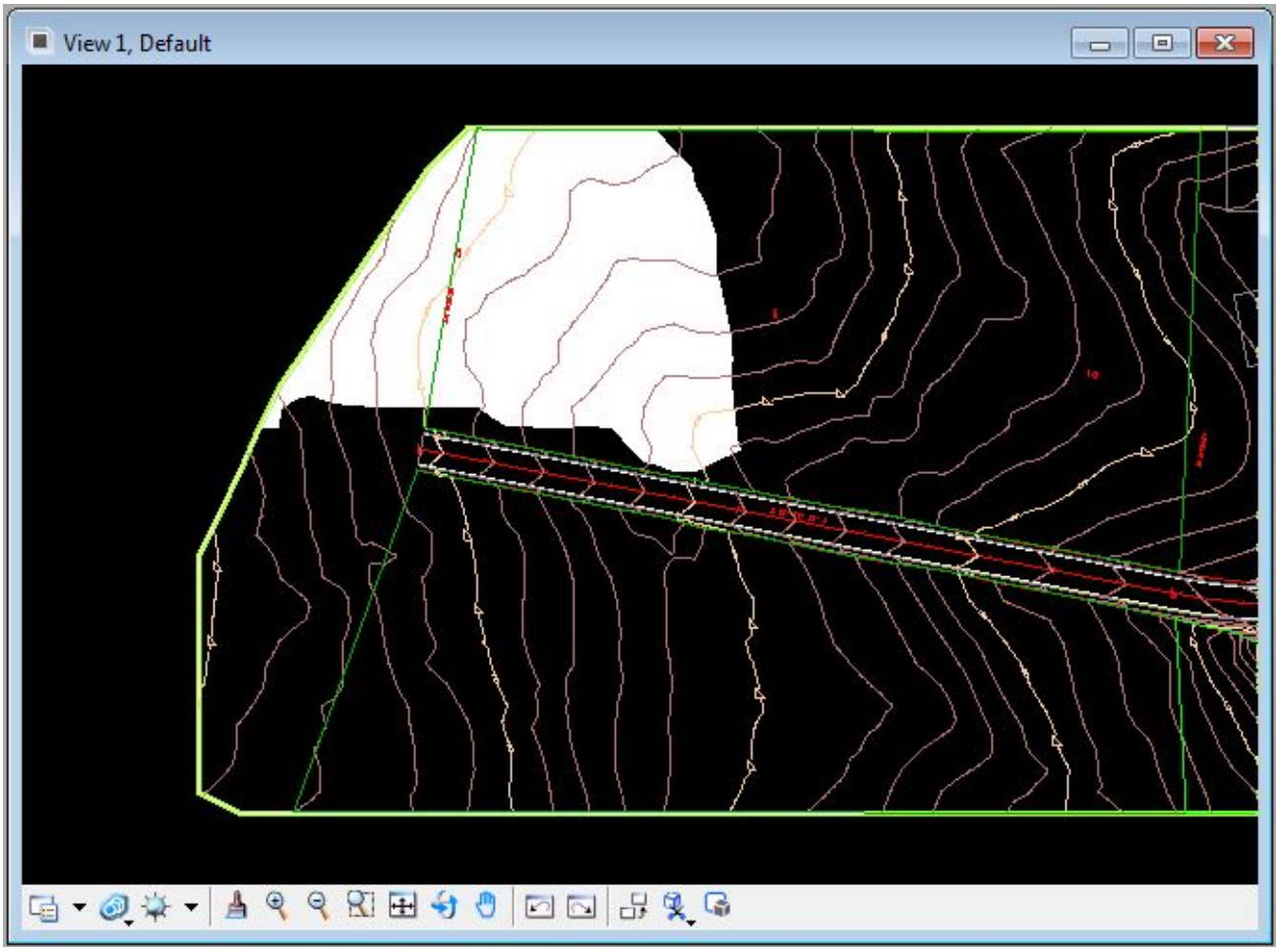


c) Click the **DP Pour Point**. Data Point in the dgn file in the approximate location shown below:



d) Click the **DP Create Shape** button and data point inside the drainage area delineation from the previous step. This procedure will place a temporary fill in the drainage area. Data Point to accept this shape and Update the Microstation View to remove the temporary fill. The Drainage Area Shape has been drawn in the dgn file.

NOTE: Scrolling or zooming between Step 3 and Step 4 will cause the temporary watershed delineation to disappear. However, the information is still present and following Step 4 will still create the Drainage Area Shape.

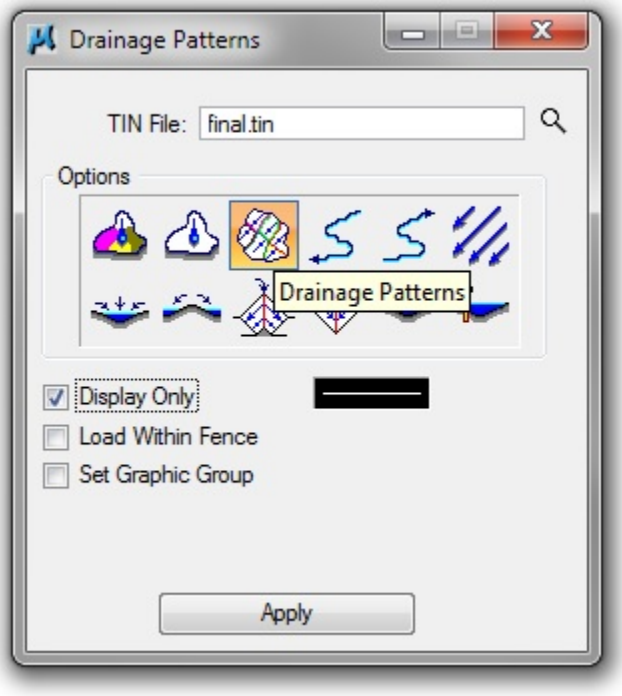


3.3 Drainage Patterns

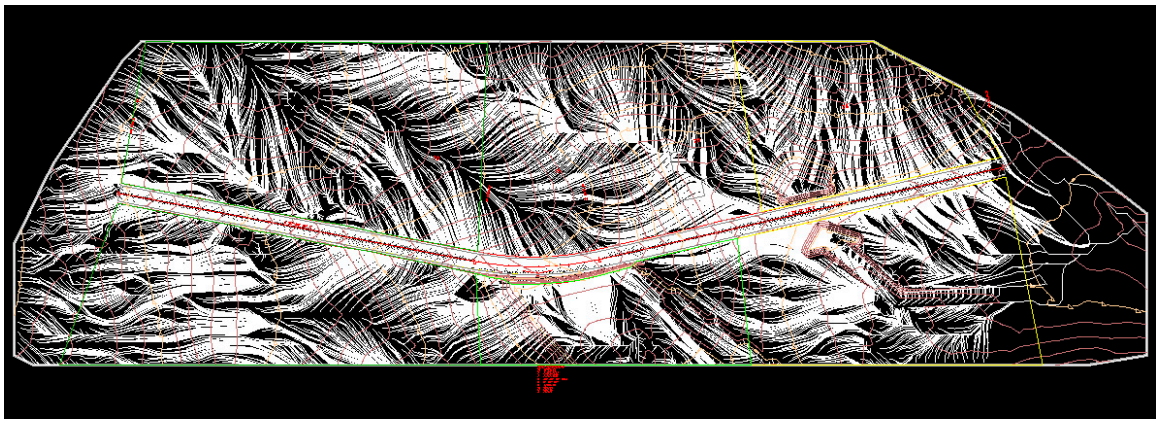
The Drainage Patterns tool evaluates the flow paths contained within the TIN. This tool performs a downstream trace from the centroid of each triangle.

a) Select the DTM Drainage Icon **Drainage Patterns**. Toggle ON Display Only and click the **Apply** button to exhibit the Drainage Patterns for the tin file.

NOTE: Throughout this exercise, Display Only will be chosen, if available, so that the graphics will delete when the view is refreshed.



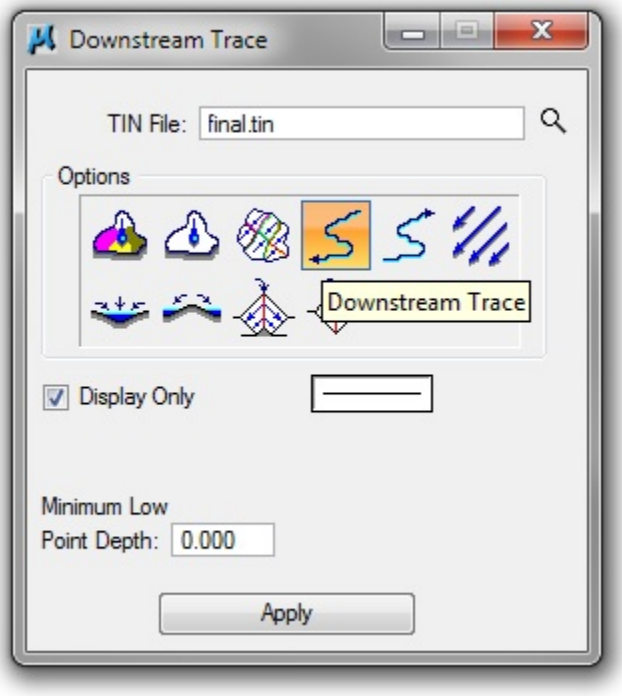
NOTE: Pressing the Escape button (on the keyboard) will terminate the current process before completion.



3.4 Downstream Trace

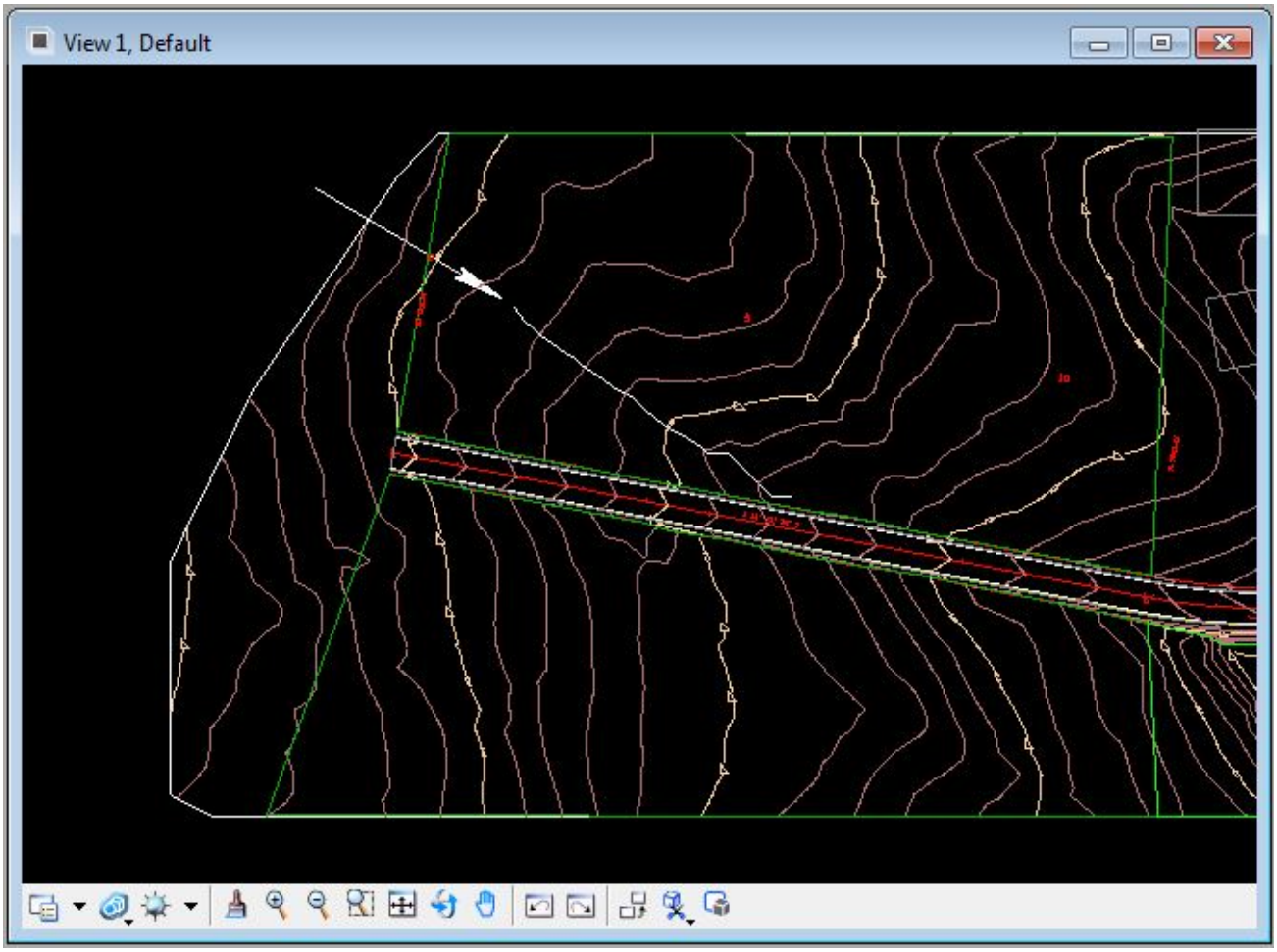
The Downstream Trace tool delineates the flow path downstream from a given point in the TIN. The indicated path follows the steepest descent from the point through the TIN terminating at a low point or the edge of the TIN.

a) Select the DTM Drainage Icon **Downstream Trace**. Toggle ON Display Only and click the **Apply** button.



NOTE: Setting the Minimum Low Point Depth to a value above 0.00 will allow the downstream trace to pass through small, localized depressions and continue downstream.

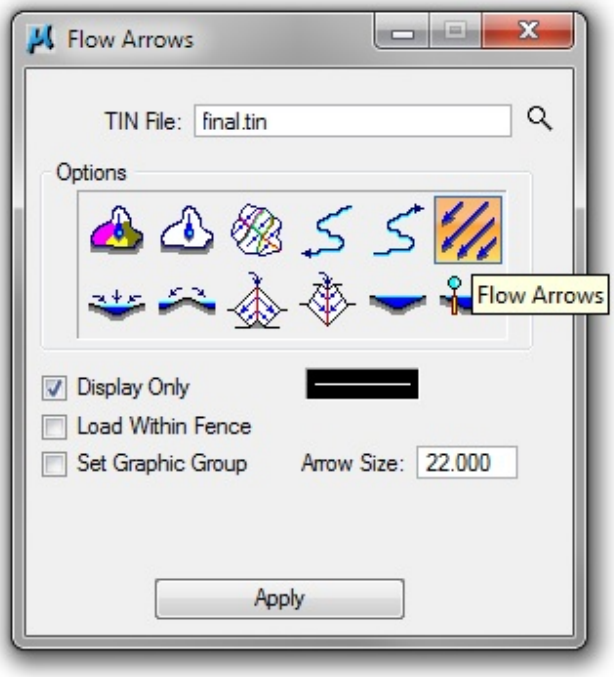
b) Click in the design file within the limits of the tin hull. A downstream trace will appear from the cursor data point location to the nearest low point to which the water will drain.



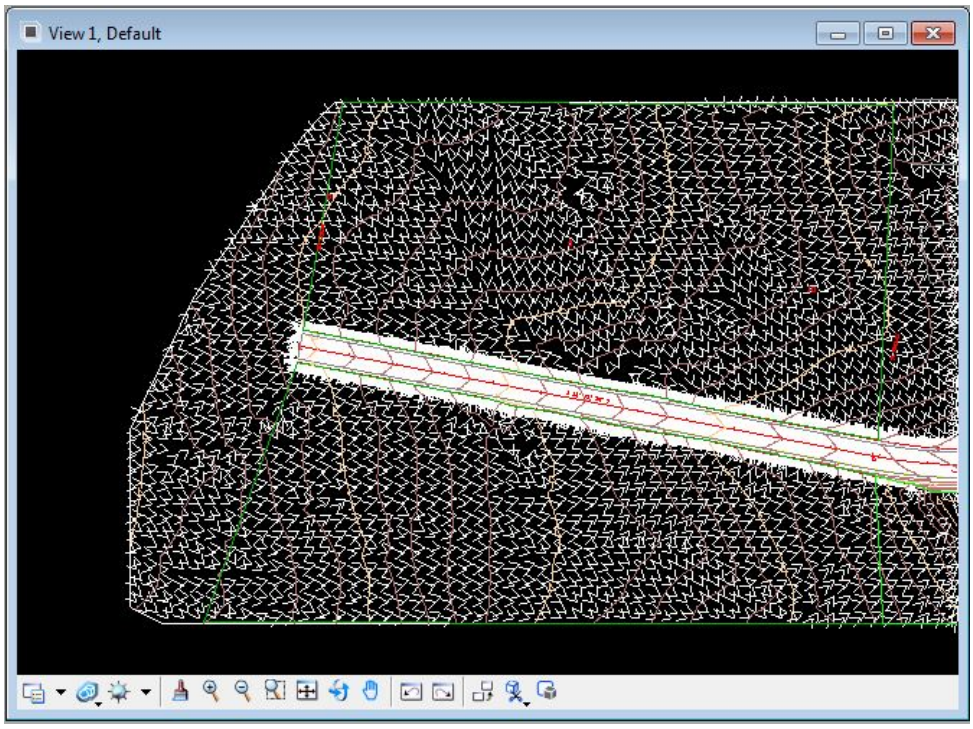
3.5 Flow Arrows

The Flow Arrows tool indicates the direction of flow within the triangles of the TIN.

a) Select the DTM Drainage Icon **Flow Arrows**. Toggle ON Display Only, set the arrow size as shown, and click the **Apply** button.



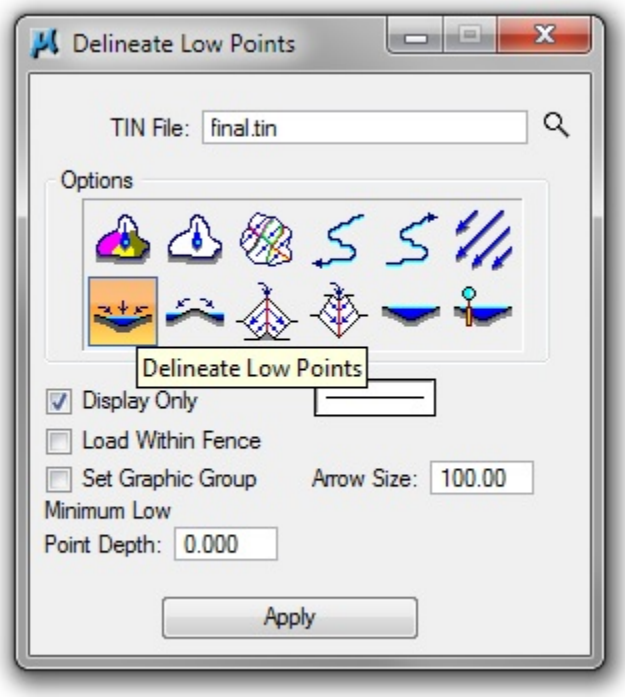
The Drainage Flow Arrows are drawn in the design file.



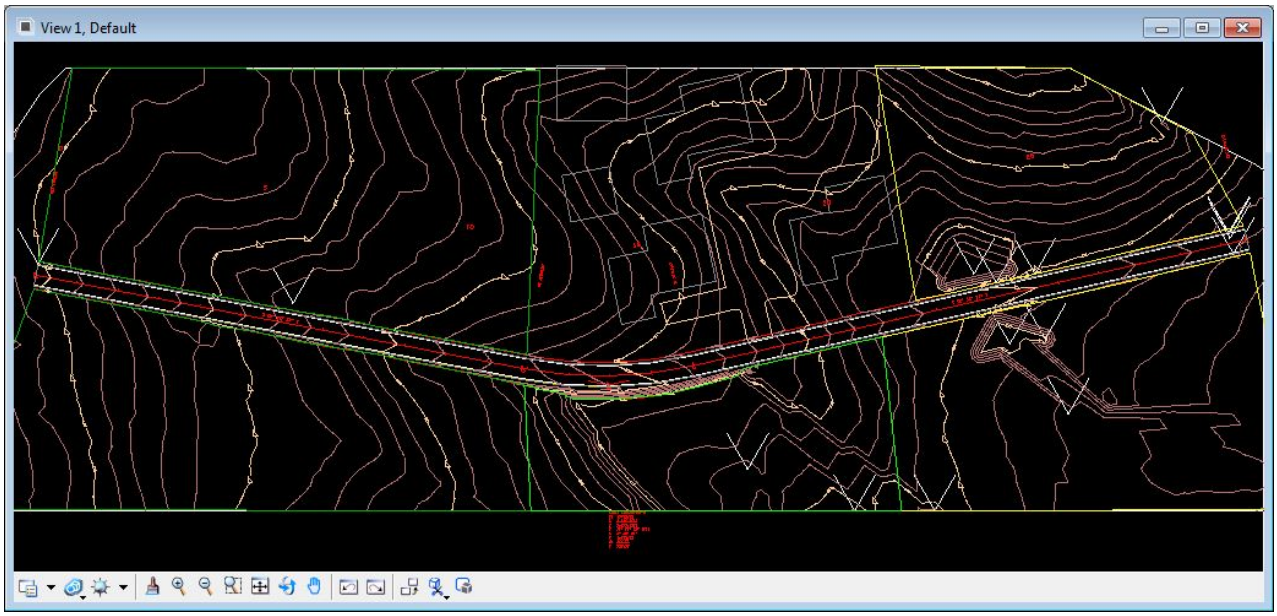
3.6 Delineate Low Points

The Delineate Low Points tool locates all low points within a region of a TIN. A flow arrow is placed and the text "LP" is placed at the triangle vertex. This is an excellent tool to use when choosing an initial location for catch basins on sag points as well as locations in ponding areas.

a) Select the DTM Drainage Icon **Delineate Low Points**. **Toggle ON Display Only**, **set the arrow size as shown**, and **click** the **Apply** button.



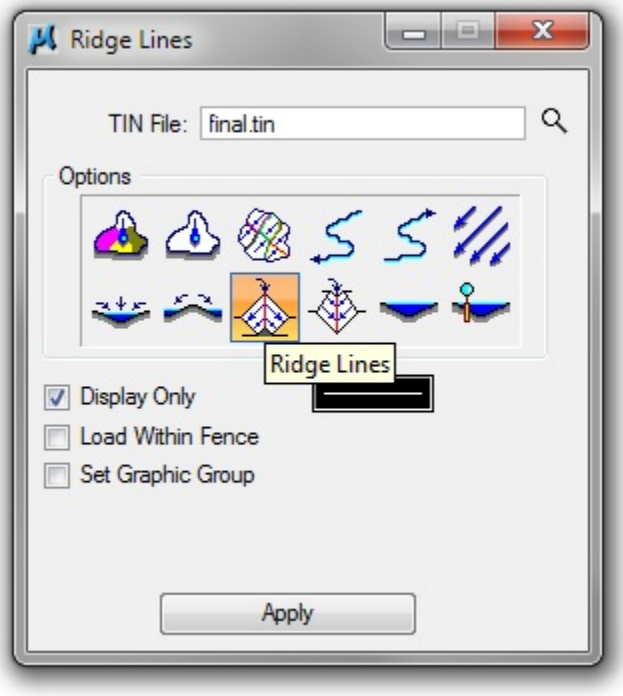
The Low Points are drawn in the design file.



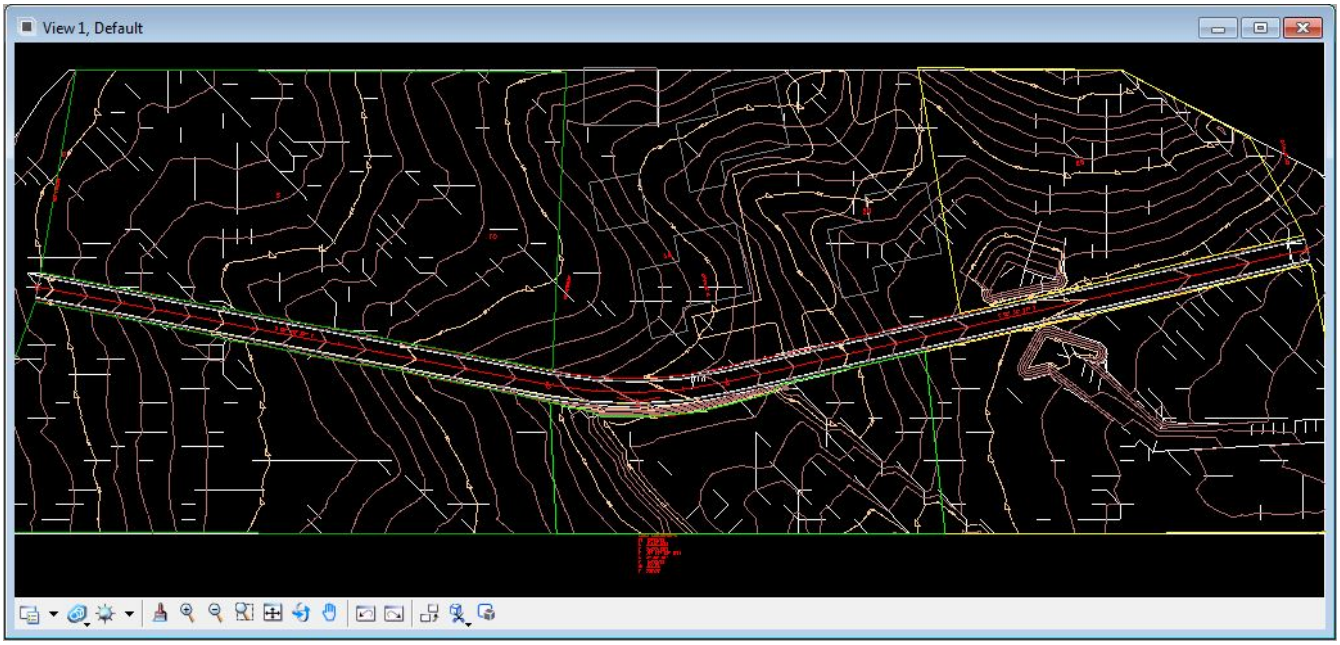
3.7 Ridge Lines

The Ridge Lines tool indicates the ridgelines within a TIN. A ridge line is defined as a triangle edge where the flow on each side of the edge is away from the edge

a) Select the DTM Drainage Icon **Ridge Lines**. Toggle ON Display Only, and click the **Apply** button.



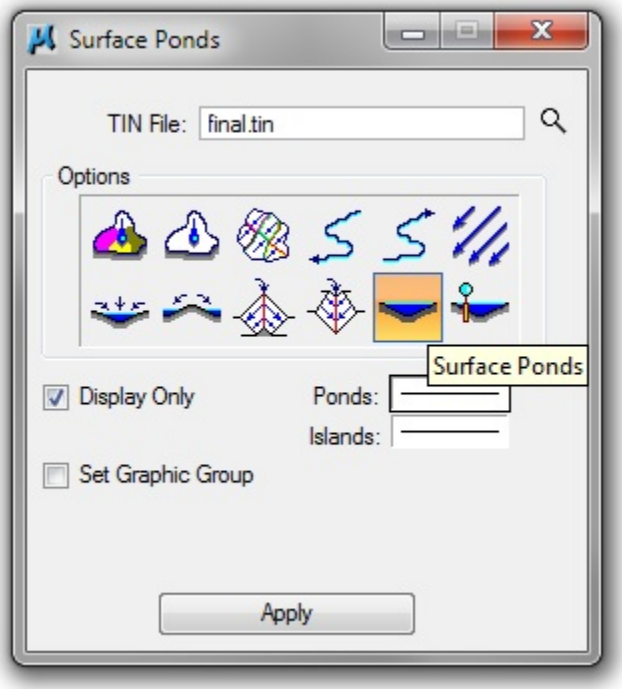
The Ridge Lines are drawn in the design file.



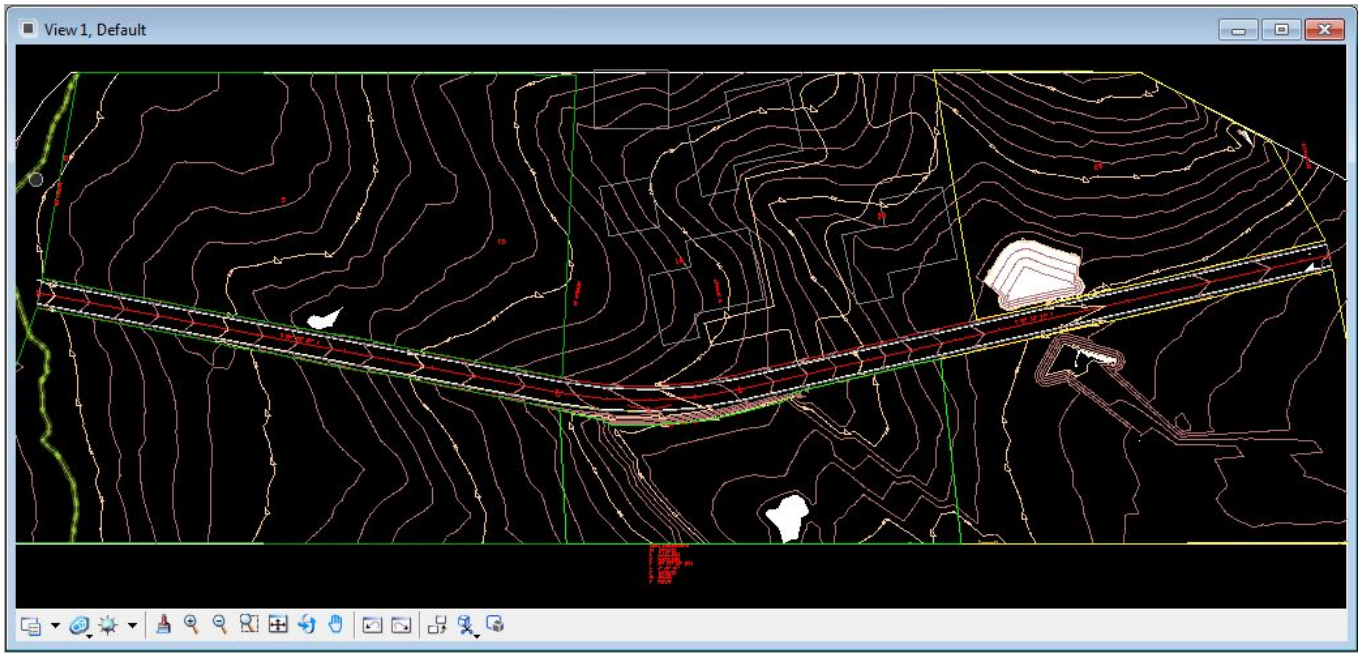
3.8 Surface Ponds

The Surface Ponds tool delineates the area(s) of ponded water within the specified TIN.

a) Select the DTM Drainage Icon **Surface Ponds**. Toggle ON Display Only, and click the **Apply** button.



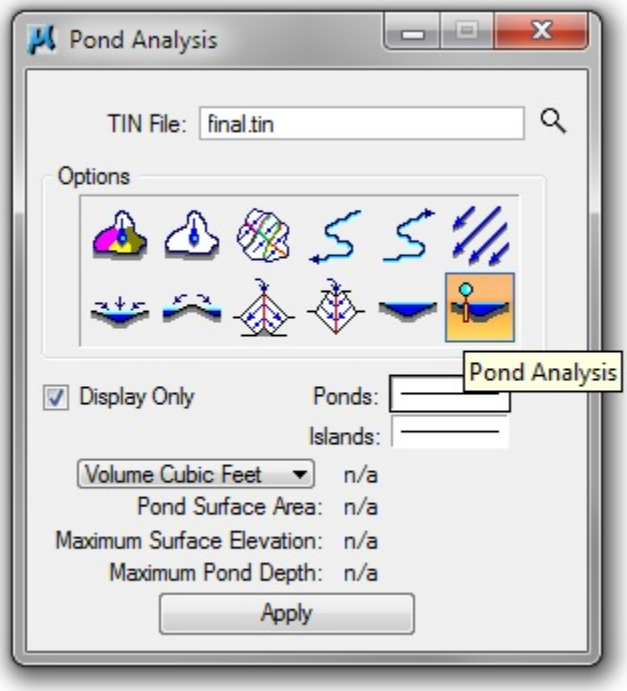
The surface ponds are drawn in temporary fill as shown below:



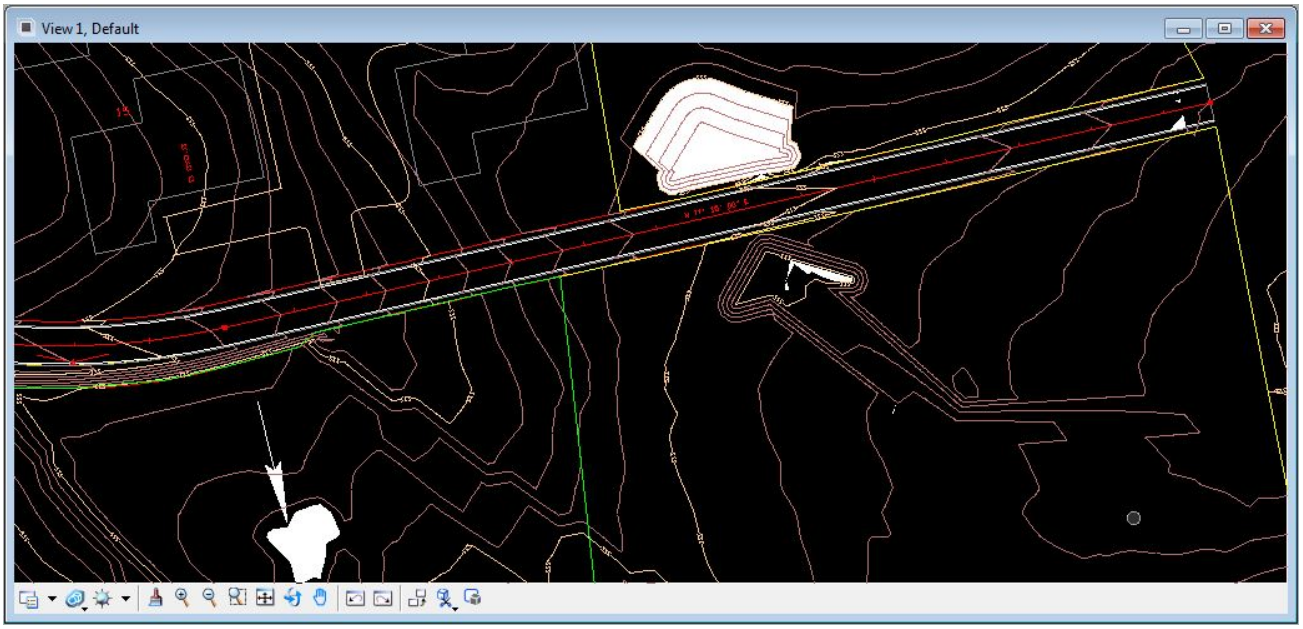
3.9 Pond Analysis

The Pond Analysis tool traces a point downstream to a low point and fills it giving the volume, maximum depth, and maximum elevation. In addition, the pond delineation is graphically displayed

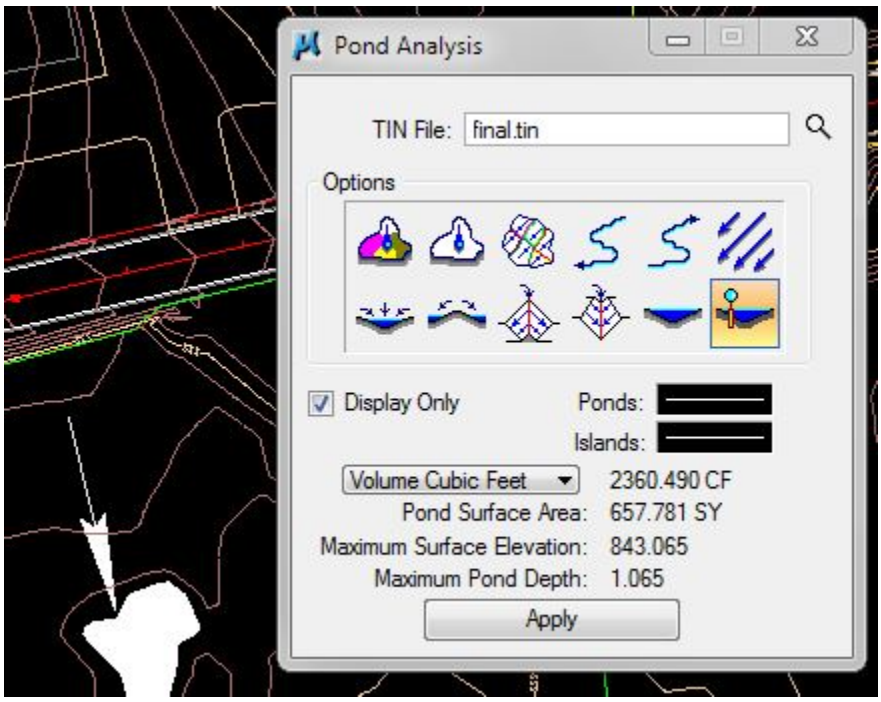
a) Select the DTM Drainage Icon **Pond Analysis**. Toggle ON Display Only, and click the **Apply** button.



b) Data Point near the location shown below:



c) The Pond is filled and pond characteristics computations performed:



NOTE: Other DTM Tools are available from **Applications> GEOPAK> ROAD>DTM TOOLS**. Surface analysis tools are the second from the end. All of these tools are available under task navigation through **DTM Tools** when Geopak's Civil Workflows is active.