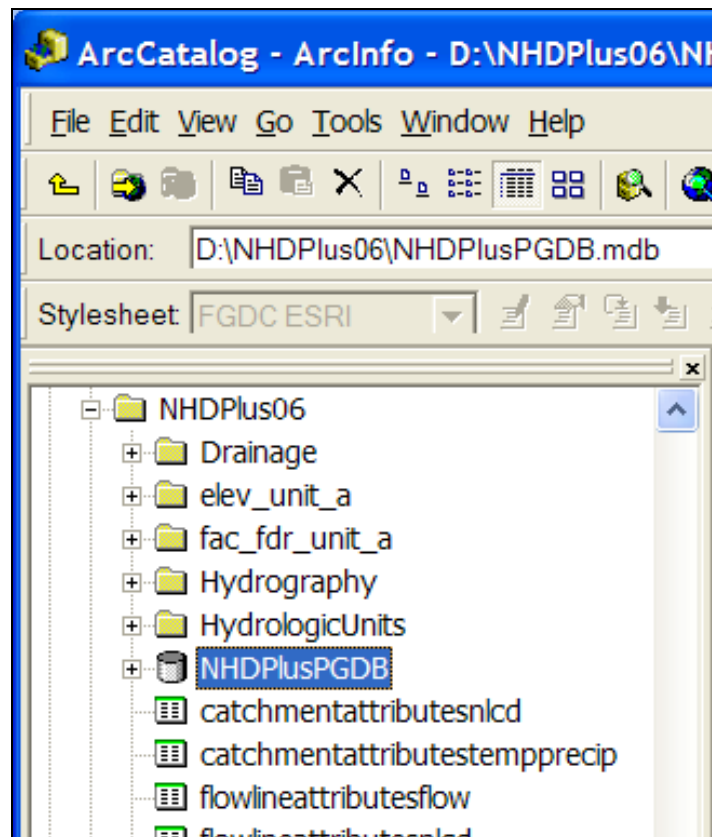


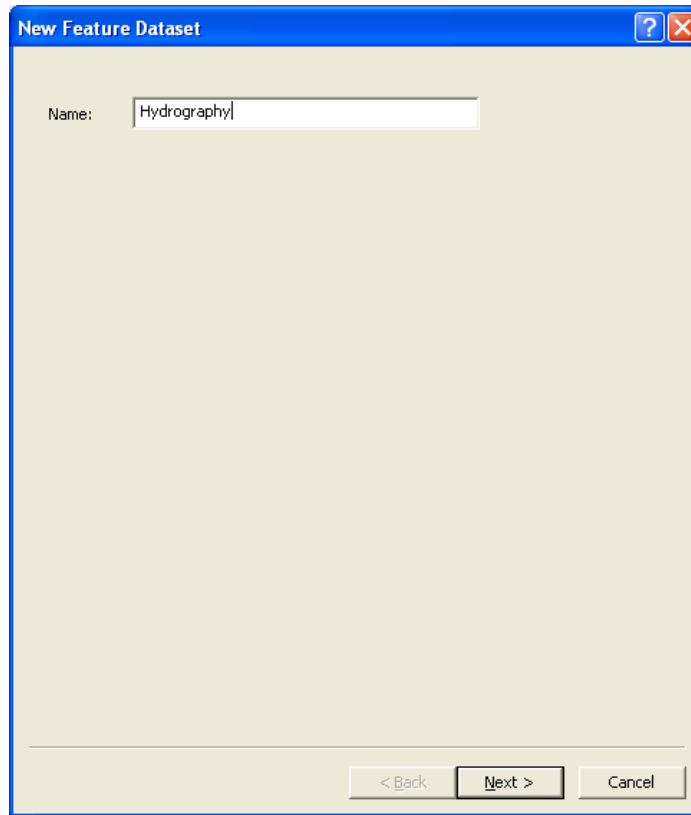
Exercise # 3: Navigating NHD with Geometry – Last updated 04/30/2008

This exercise requires the ArcHydro tools. If the ArcHydro tools have not yet been installed, see NHDPlus Exercise 0: Preparation.

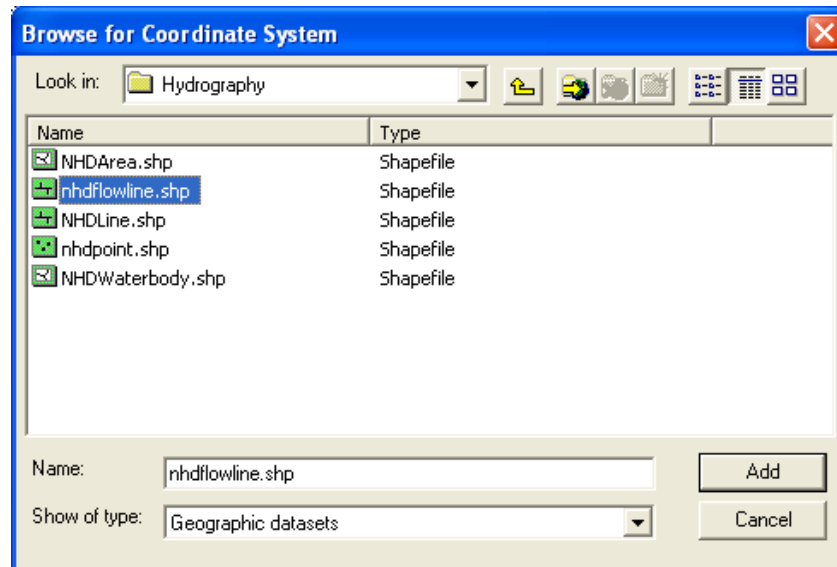
1. Start ArcCatalog.
2. Using ArcCatalog, create a new personal geodatabase and a geometric network from the NHDFlowlines
 - a. Right-click on the \NHDPlus06 folder, go to **New, Personal Geodatabase**. The database will be added to the left and right windows. Rename the database to NHDPlusPGDB.



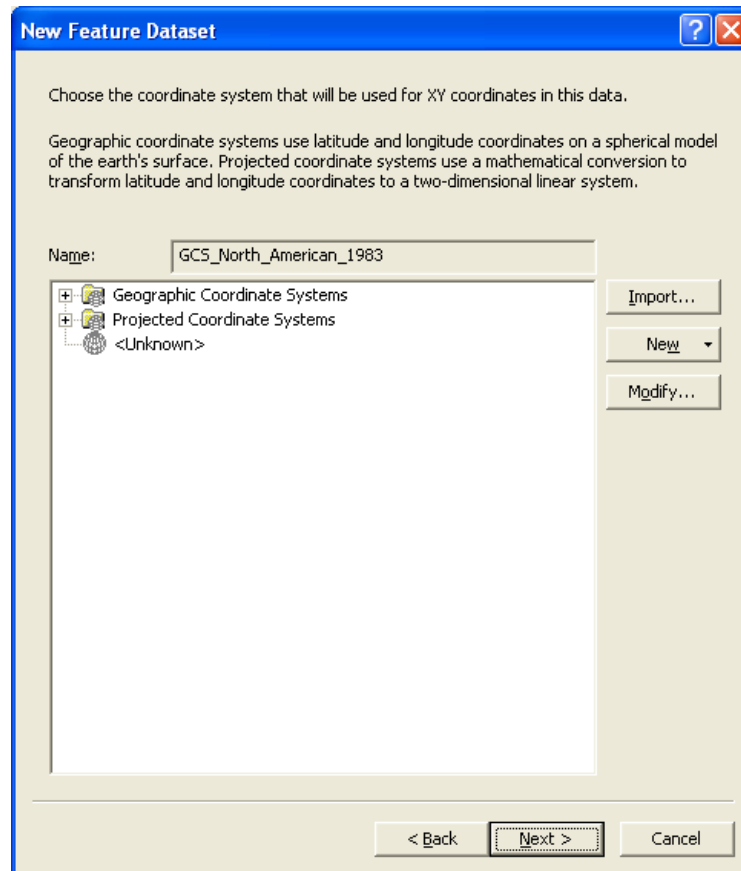
- b. Right-click on NHDPlusPGDB in the left window, go to **New, Feature Dataset**. In the **New Feature Dataset** dialog,
- Name** the feature dataset **Hydrography**.



- Click **Next**.
- The next screen prompts you to choose a coordinate system. Click **Import**. In the NHDPlus06 directory search for the nhdflowline.shp and add it.

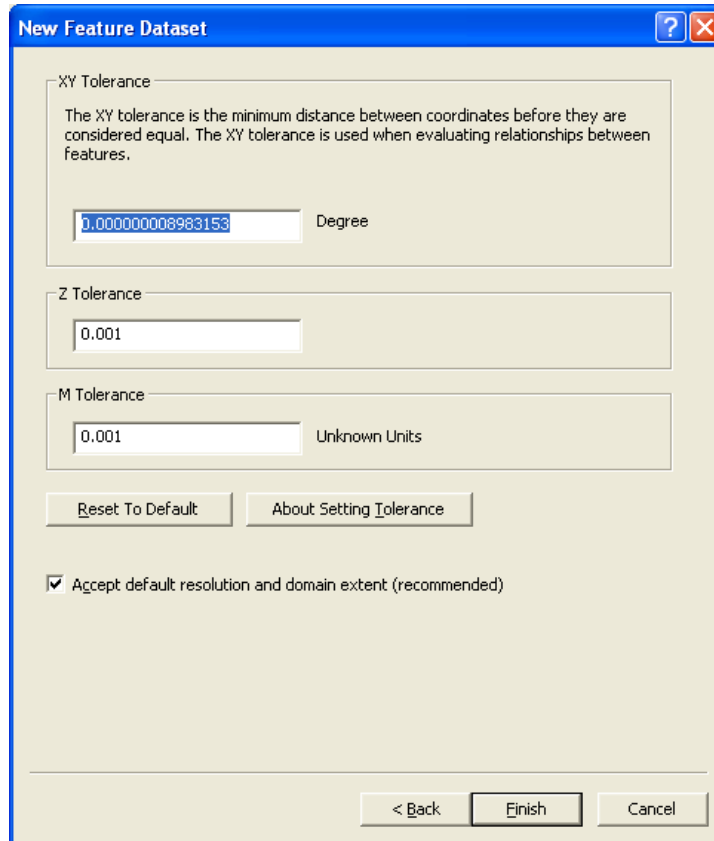


iv. Click **Next**

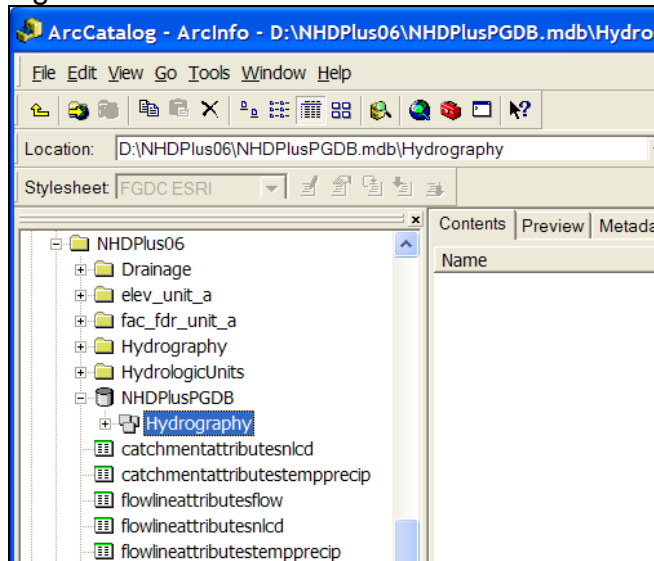


v. Choose the coordinate system that will be used for Z coordinates and leave the Name field as <none> and click **Next**.

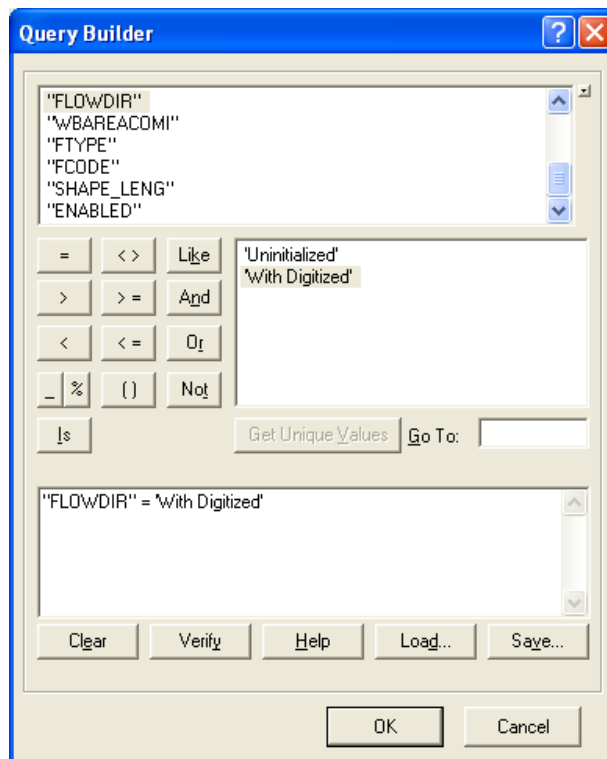
vi. Leave XY, Z and M Tolerance field defaults and click **Finish**.



- v. The **New Feature Dataset** dialog is now complete. The new feature dataset called **Hydrography** is now created and appears in the left window of ArcCatalog under the NHDPlusPGDB personal geodatabase.



- c. Right-click on the **Hydrography** feature dataset in the left window. Go to **Import, Feature Class (single)**. In the **Feature Class to Feature Class** dialog,
- Use the **Folder** button to browse to \NHDPlus06\Hydrography and select **NHDFlowline** for **Input Features**
 - Leave **Output Location** as:
D:\NHDPlusExercises\NHDPlus06\NHDPlusPGDB.mdb\Hydrography
 - Enter **NHD_KnownFlow** in **Output Feature Class**
 - Use the **SQL** button to build an **Expression** as shown below. This expression extracts from all the NHDFlowlines, only those with known flow direction. The expression should read: "FLOWDIR" = 'With Digitized' Note the single quotes around the 'With Digitized'. Click on **Get Unique Values** in order to select 'With Digitized'. Click **OK**.



- v. Returning to the **Feature Class to Feature Class** dialog, scroll down in the **Field Map** box and right click **ENABLED** and select properties. Change the name to **ENABLED_CHAR**. Click **OK**.

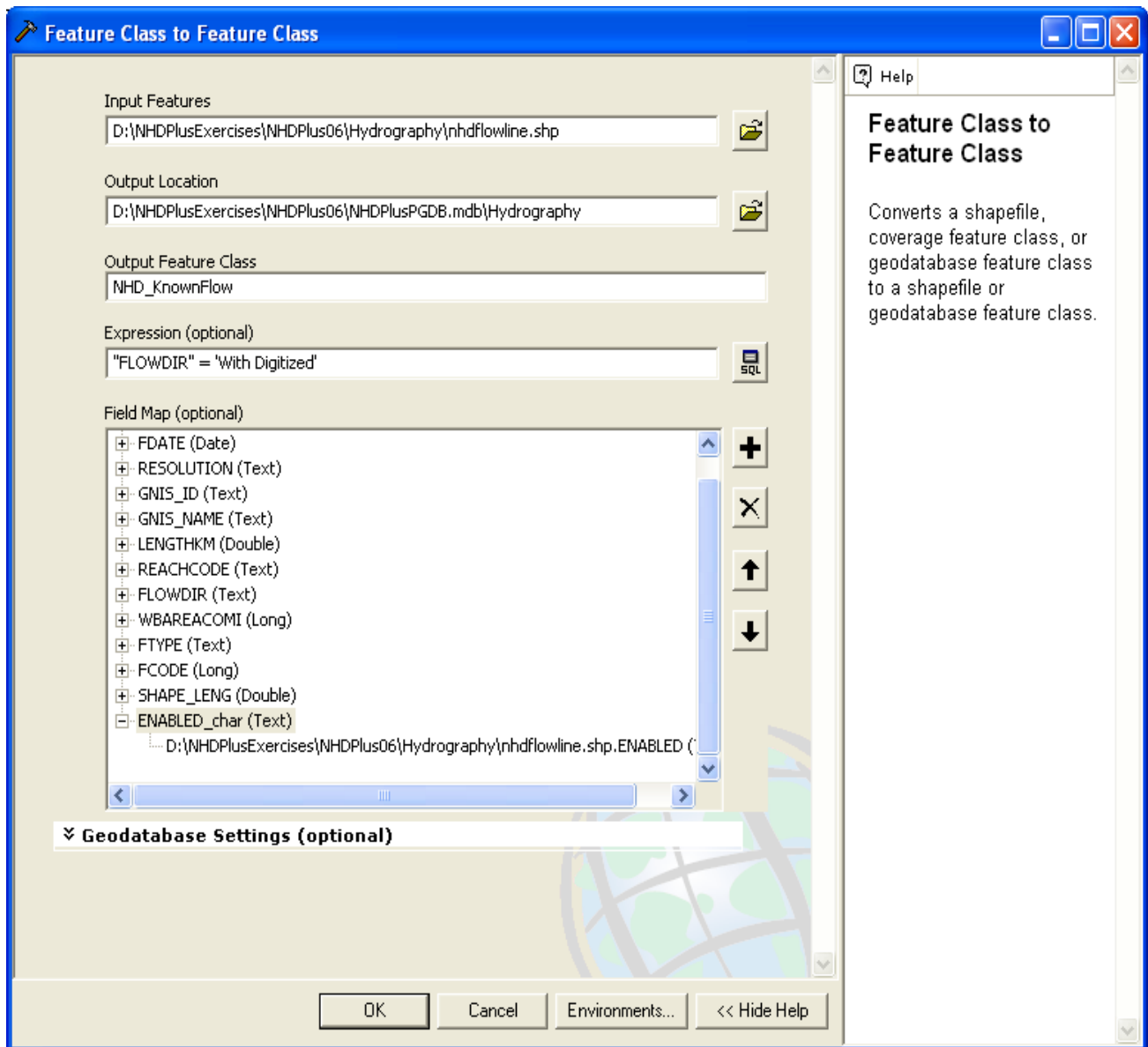
The screenshot shows the 'Output Field Properties' dialog box with the following settings:

- Name: ENABLED_CHAR
- Alias: ENABLED
- Type: Text
- Properties:

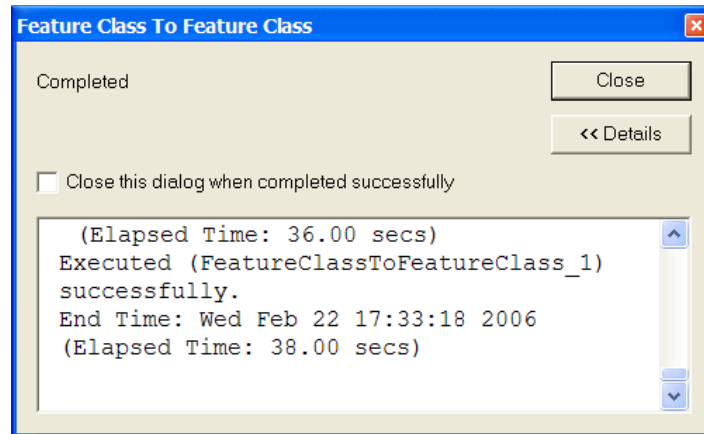
Length	6
- Merge Rule: First
- Delimiter: (empty)

Buttons: OK, Cancel

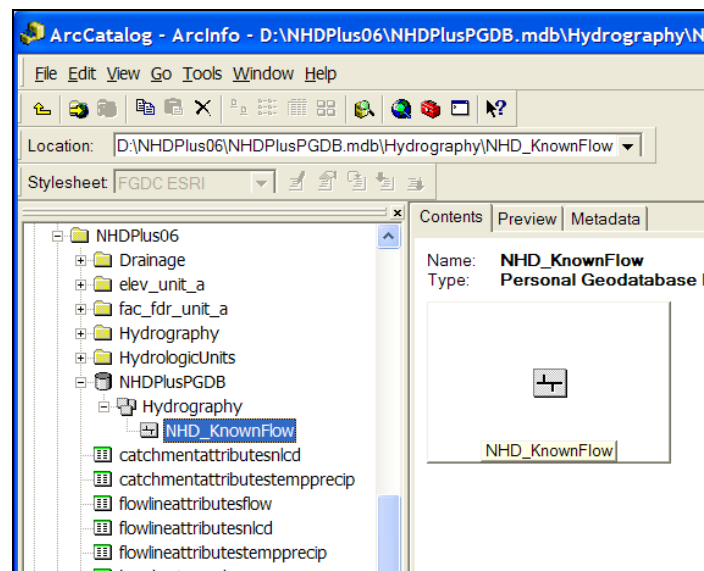
- vi. Leave the remaining items in the dialog at their default values and click **OK**.



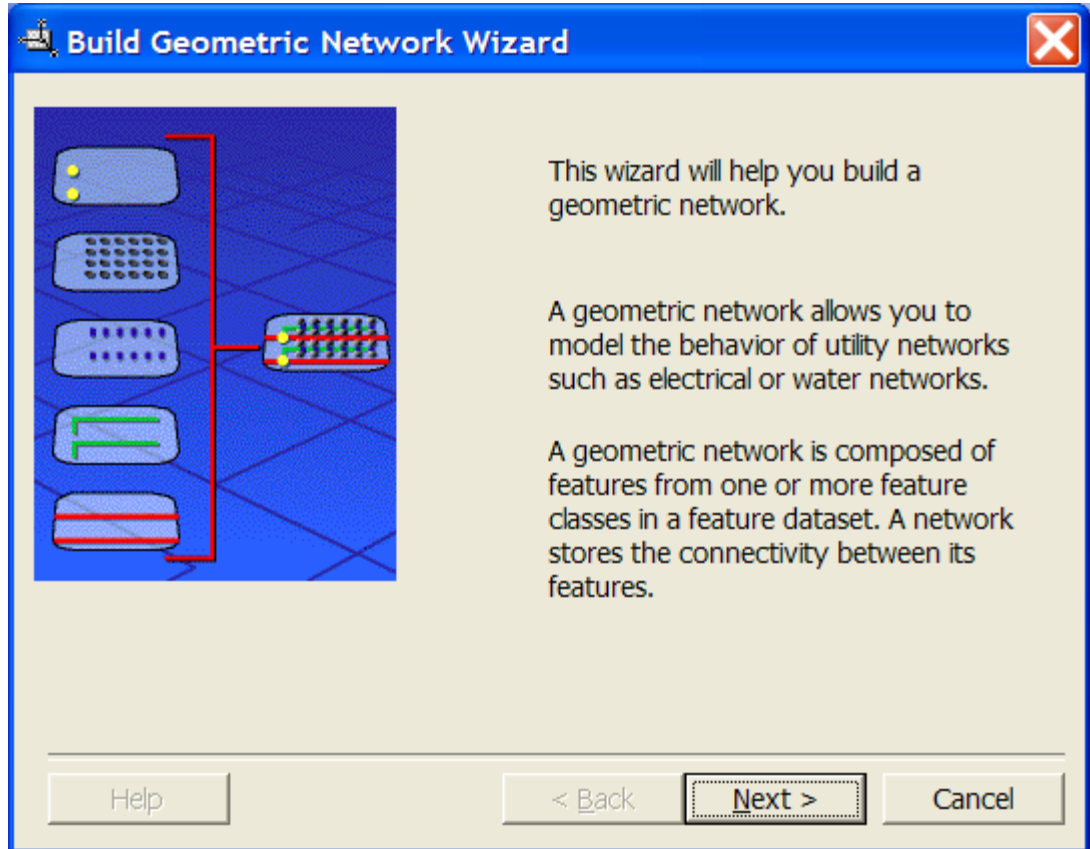
- vii. The import **Feature Class to Feature Class** operation will execute. When the word “Completed” appears in the window, click **Close**.



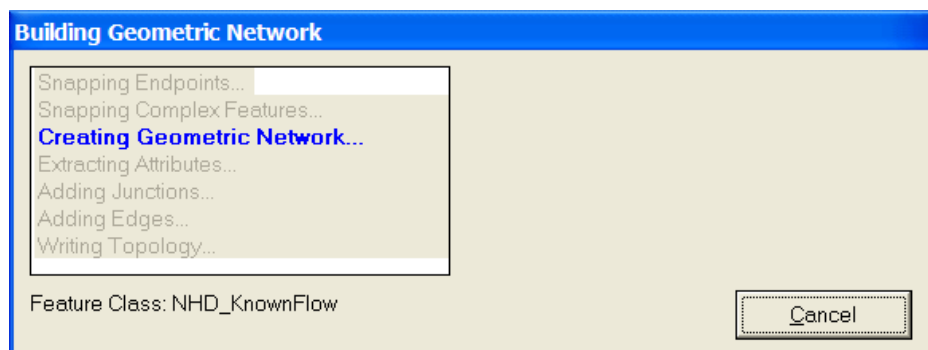
- viii. The new feature class called NHD_KnownFlow is now created and appears in the left window of ArcCatalog under the Hydrography feature dataset.



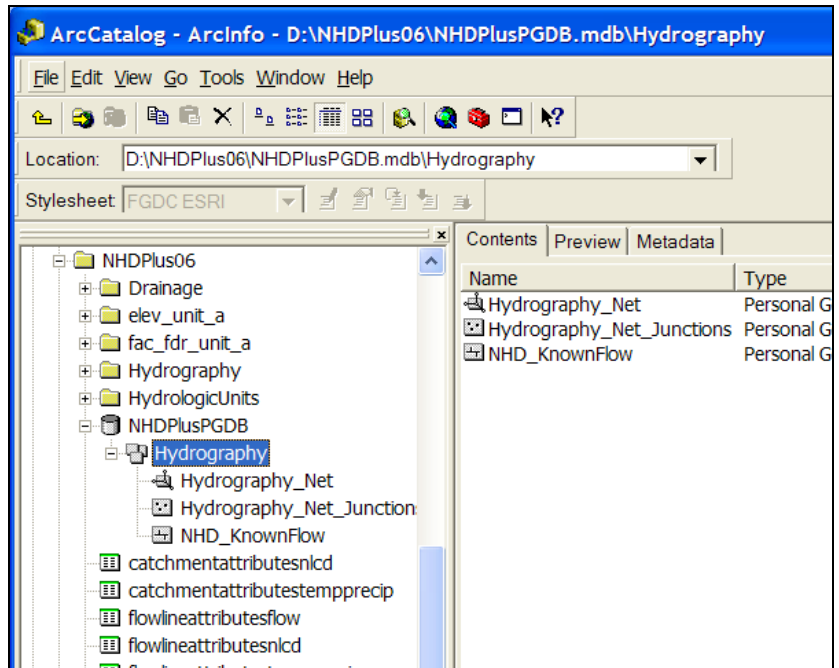
- d. Right-click on the **Hydrography** feature dataset in the left window. Go to **New, Geometric Network**. Proceed through the Build Geographic Network Wizard, taking **all the defaults**. The geometric network called hydrography_net will be created.



The last step of the wizard will build the new geometric network from the NHD_KnowFlow feature class.

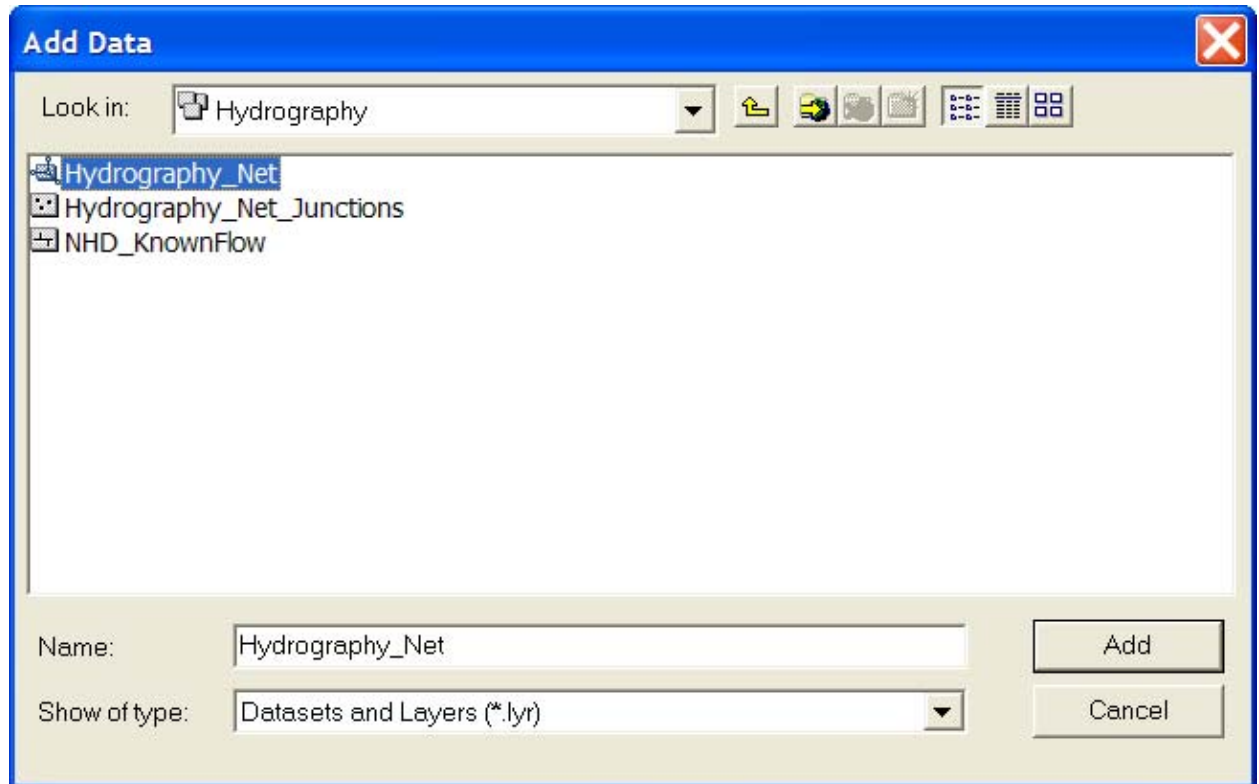


The geometric feature classes, Hydrography_net and Hydrography_Junction will appear in the left window of ArcCatalog under the Hydrography feature dataset.

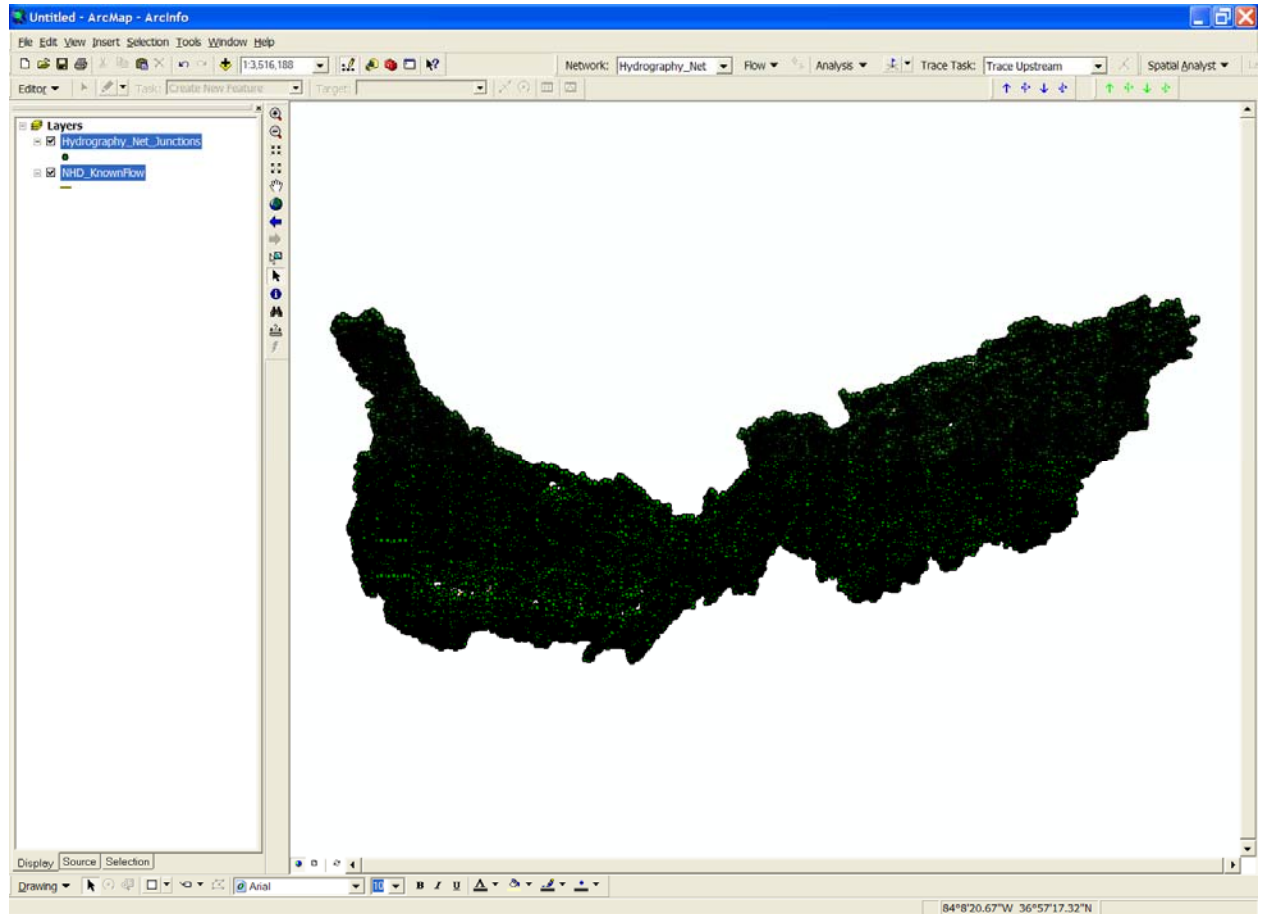


e. Close ArcCatalog.

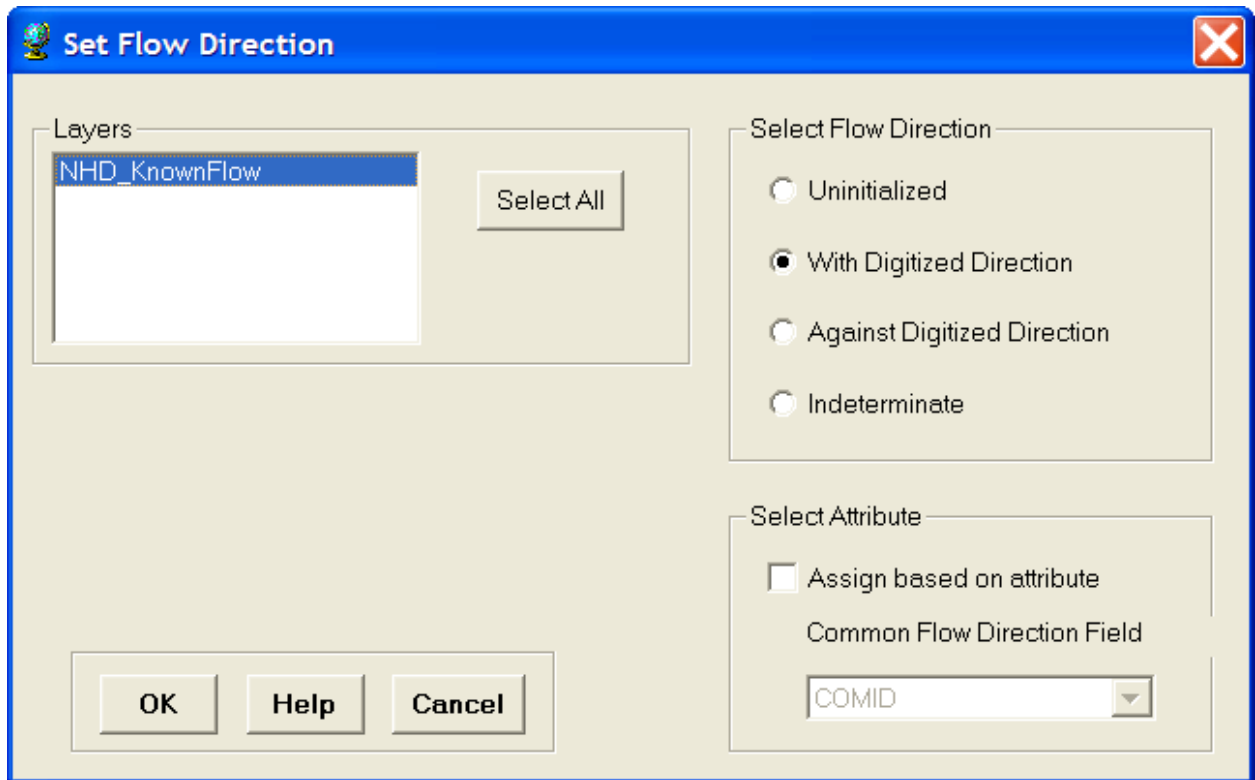
3. Start ArcMap.
4. Using ArcMap,
 - a. Use the **File, Add Data** menu. In the **Add Data** dialog, navigate to the \NHDPlus06 folder, under the NHDPlusPGDB, select Hydrography and then Hydrography_Net. Click **Add**.



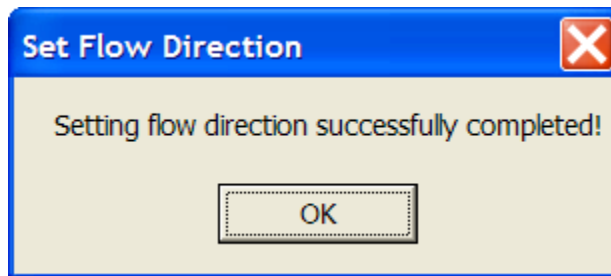
- b. At this point, the content of your map should contain the NHD_KnownFlow and the Hydrography_Net_Junctions layers.




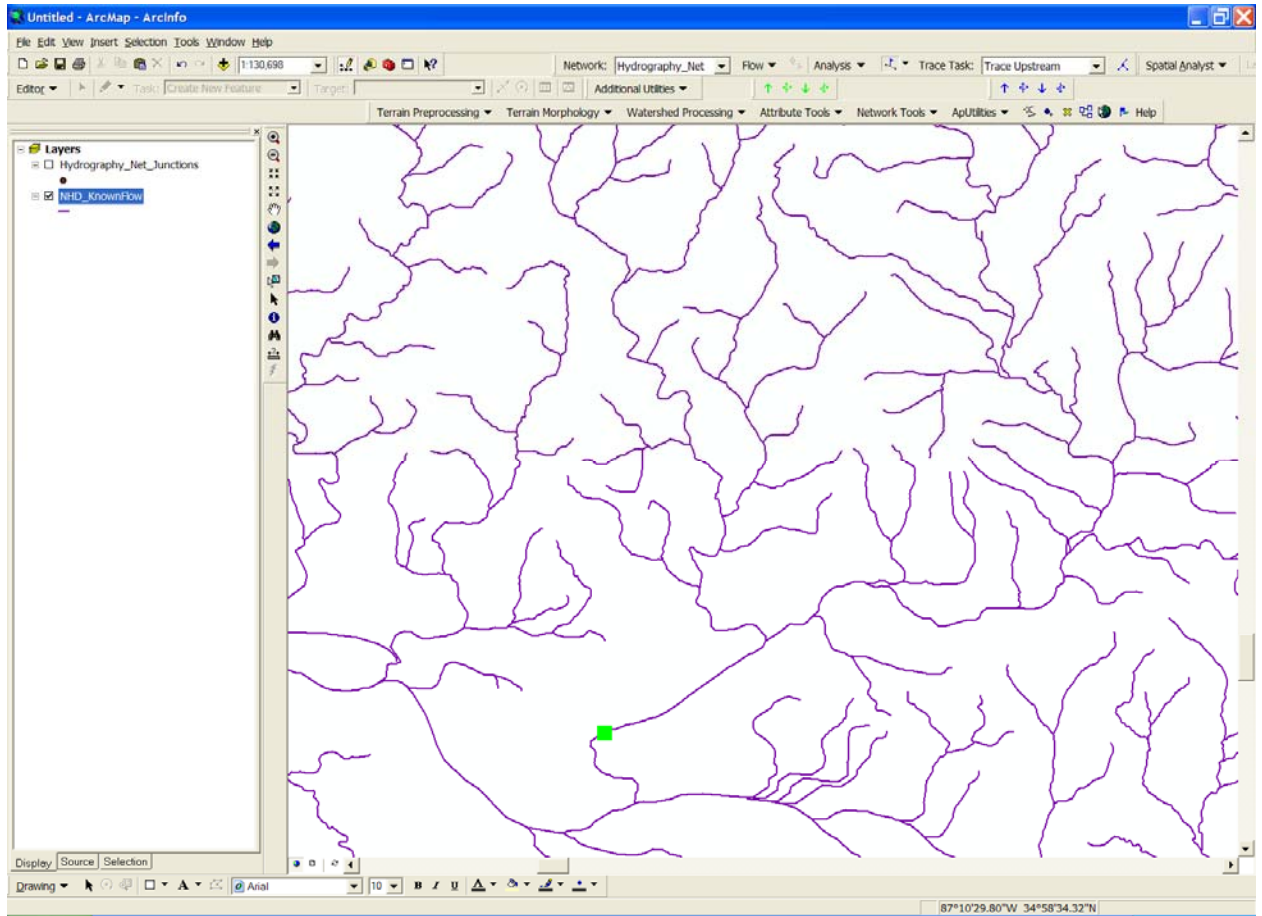
- c. Before navigation can be accomplished, one last operation is needed. The flow direction on the network must be established. To establish flow direction using native ArcMap, you will need to add sinks to each downstream network end. This can be very time consuming event even in a moderately sized area like region 06. An easy way to establish flow direction is to use the ArcHydro tools.
- d. Using the ArcHydro tools, click **Network Tools, Set Flow Direction**. In the **Set Flow Direction** dialog, select **NHD_KnownFlow**, check **With Digitized Direction** and click **OK**. The **Set Flow Direction** utility will execute and may take a few minutes to complete.



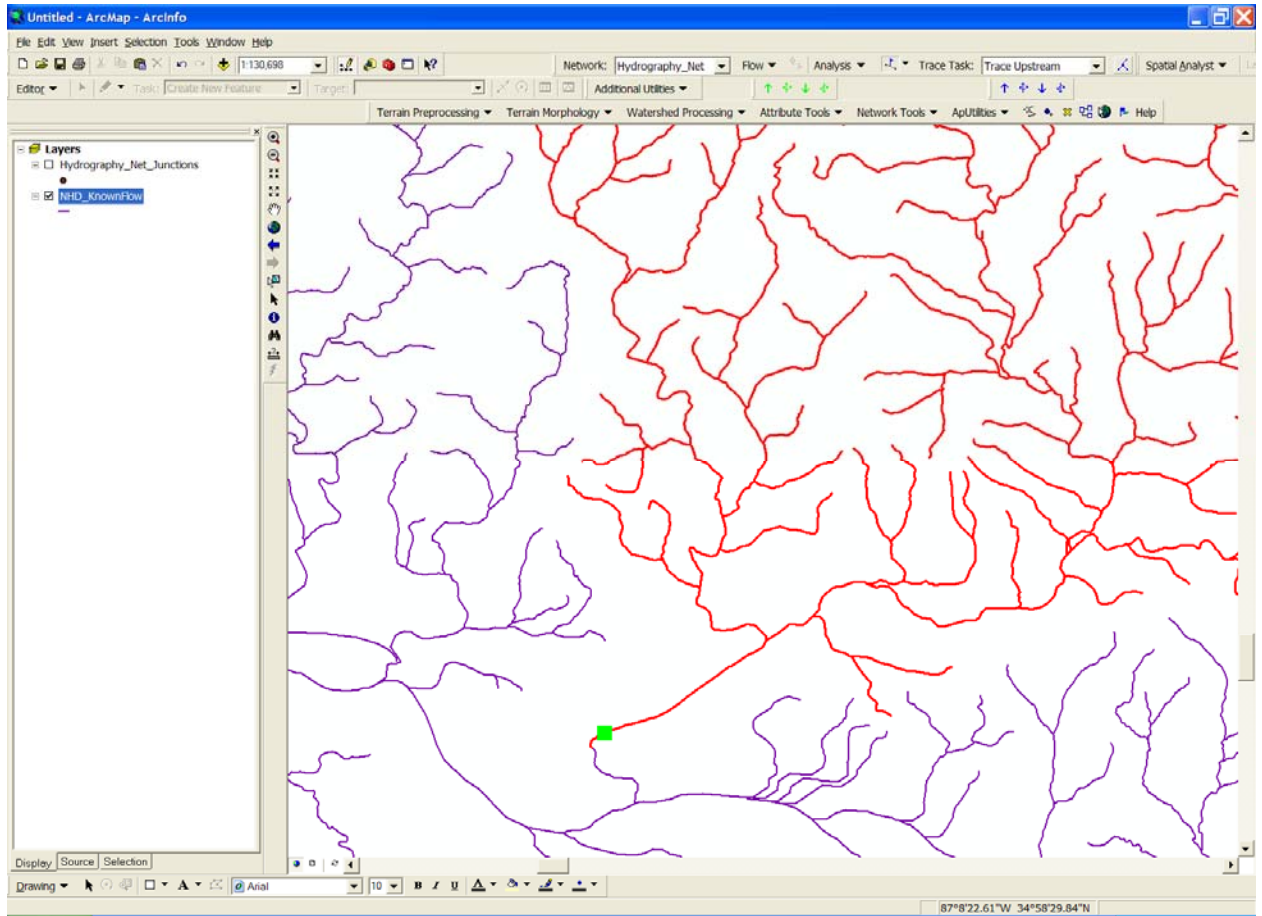
The status line at the bottom of the ArcMap window will show the progress. When setting flow direction is complete, a message window will appear.



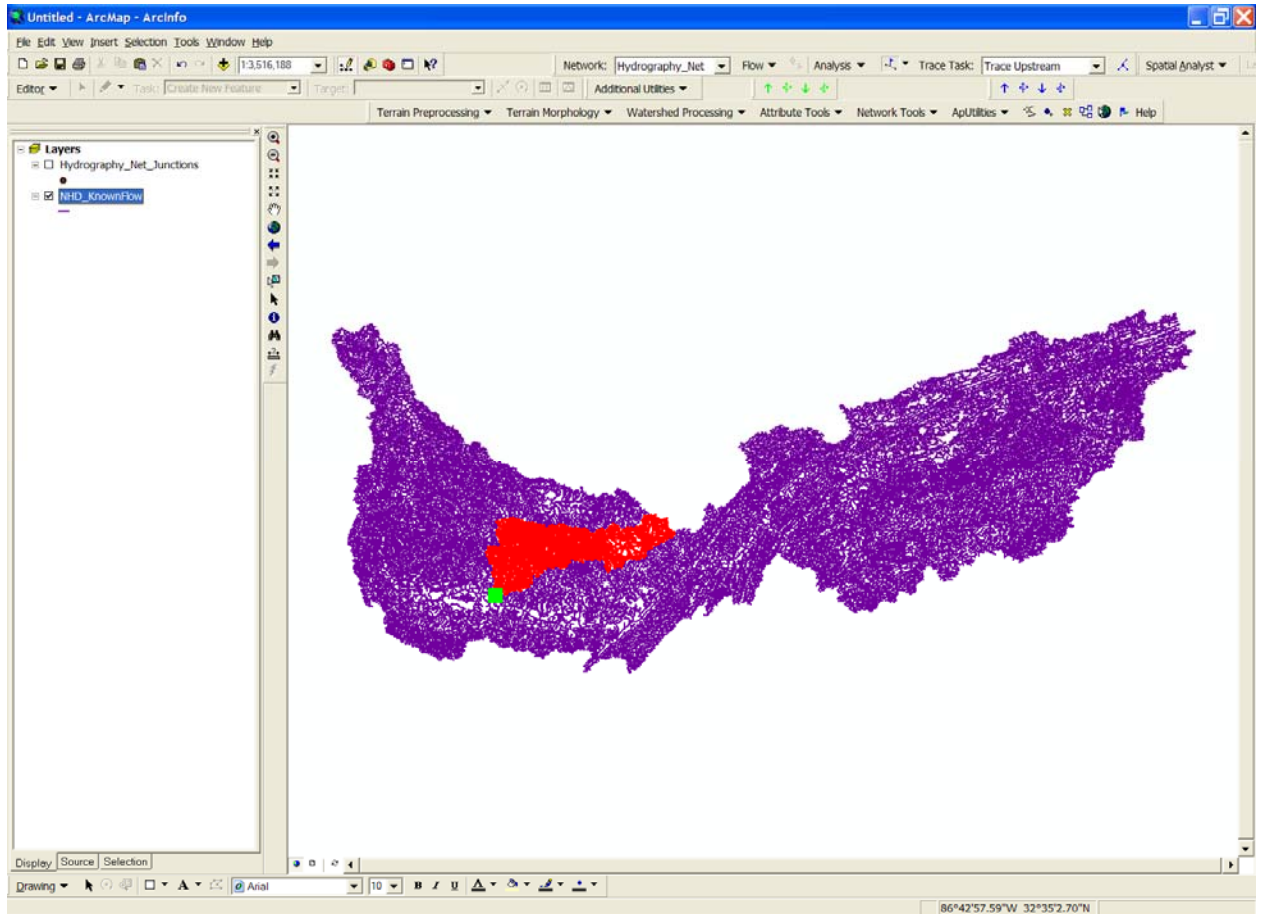
- e. Use the zoom in tool , to zoom into an area in the NHD_KnownFlow layer.
- f. Add the **Utility Network** toolbar to ArcMap. Use the **Add Junction Flag** tool, to place a flag on a junction or the **Add Edge Flag** tool, to place a flag on a network line. Use the **Trace Task:** pull down to select **Trace Upstream**.



g. Click the **Solve** button. The trace results will be displayed in red.



- h. Right click on the NHD_KnownFlow layer and select **Zoom to Layer** to see the results of the trace.



- i. A few cautions about geometric navigations:
 - i. NHDPlus contains logical connections between streams that flow out of the U.S. into Canada or Mexico and the streams where those waters flow back into the U.S. Since these are logical connections and there is no geometry connection, the use of geometric navigations in these areas will not work correctly.
 - ii. Occasionally, NHD features will cross with vertical separation. For example, a canal/ditch may cross over a stream/river. Geometric navigation will assume that there is a flow connection at these locations when, in fact, there is none.