Mapping the Harris County Texas Using Map Books

Presented by: Vince Hamilton, Project Manager

Abstract:
Automated mapping techniques using the MapBook application will demonstrated. The session will show how to use grids and strip maps to create the maps. The session will also show how to use VB scripts to clean up roadway labeling. The use of global and local indicators will also be explained. This process was used on the Tropical Storm Allison Recovery Project to map all of Harris County, Texas.

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Michael Baker, Jr., Inc. has been tasked with leading the effort to provide new flood plain maps for Harris County following the devastation caused by Tropical Storm Allison in June 2001. Baker leads the team of over 20 engineering and surveying firms to generate new FEMA Flood Insurance Rate Maps. This is a significant task because of the accelerated schedule. FEMA and the Harris County Flood Control District have been proactive in their efforts to support the latest technologies in the areas of LIDAR and GIS for this project. Baker's role in the QA/QC of the hydraulic data sets lead to the development of hydraulic review mapping sets and mapping applications created using MapBooks developed by ESRI.

Our coordination efforts are based on timely submissions of hydraulic data sets from multiple contractors. At Baker, we must perform quality control checks, among other items, to assure that the cross section information in the submitted hydraulic models match the 2-foot contours at the surveyed cross sections along with structure locations and other hydraulic impacts.

There are four levels of submissions by 3 different analytical teams. This review process created the need for over 2,000 maps. The maps needed to be compiled, generated and made accessible to the review team as soon as possible after a design team submission. This is where MapBooks filled the needs of the project.

The engineering staff required maps of each watershed that showed latest aerial photography, street data, existing flood plains, surveyed section lines and other hydrologic, hydraulic and topographic features. The maps will be published after the 2003 ESRI conference, so the flood-based data shown in this presentation is fictitious and should not be deemed as correct for any reference or publication. The data here is used to present the technical process used to produce a mapping product, not the actual product for the Tropical Storm Allison Recovery Project currently in progress. An example of a hydraulic review map is shown on the next page.

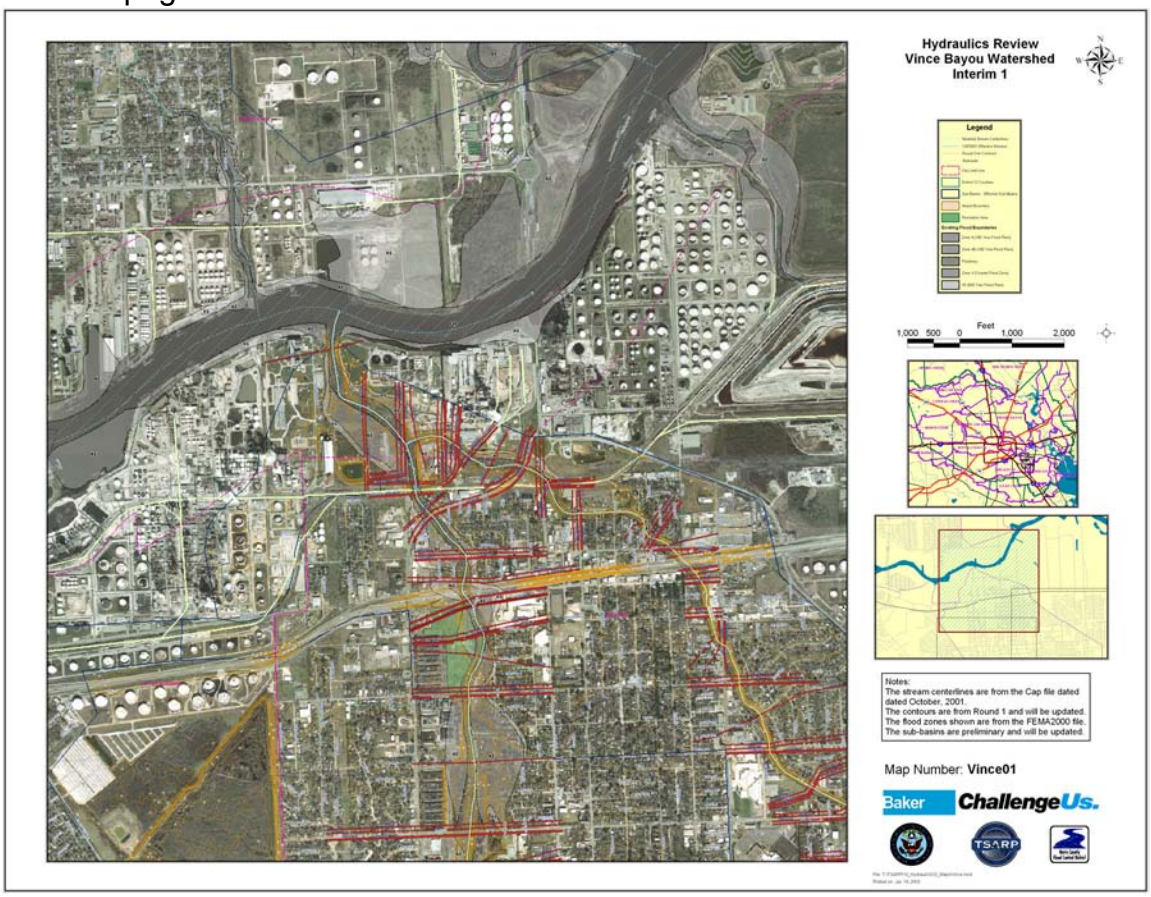


Figure 1 - Sample Hydraulic Review Map

The task at hand is to generate maps for every watershed, for every section, for every level of submittal. This is how we did it.

Step 1) Create an ArcMap 8.X project and add all of the layers required for the review map. A template was created and copied with changes made to the sources and titles to match each of the different watersheds to be studied. We then saved each of those 4 times to match the 4 different levels of submittals. Many of the background layers are turned off to reduce display refresh time. The Figure 2 shows the standard project with the sections added.

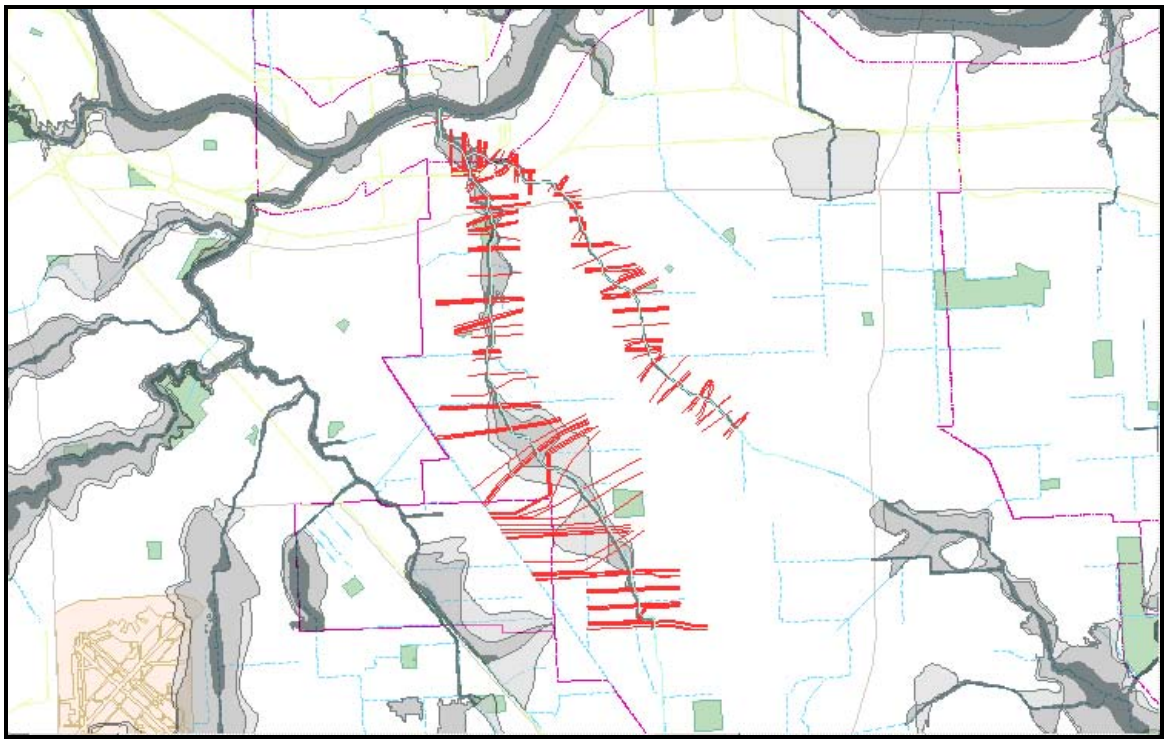


Figure 2 - Sample project with sections added

Step 2) Create a polyline shapefile to be used as the baseline for the sheet limits. Then add that layer to your project and start the editor. Add a straight line to the project that is long enough to equal the sum of the width of the total sheets. For example, if your data frame in the layout view is 4000 feet wide and you estimate that there will be 8 sheets, your line should be at least 32000 feet long. The line length does not have to be exact and we typically just judge it by eye. Figure 3 shows the line we have placed for this sample.

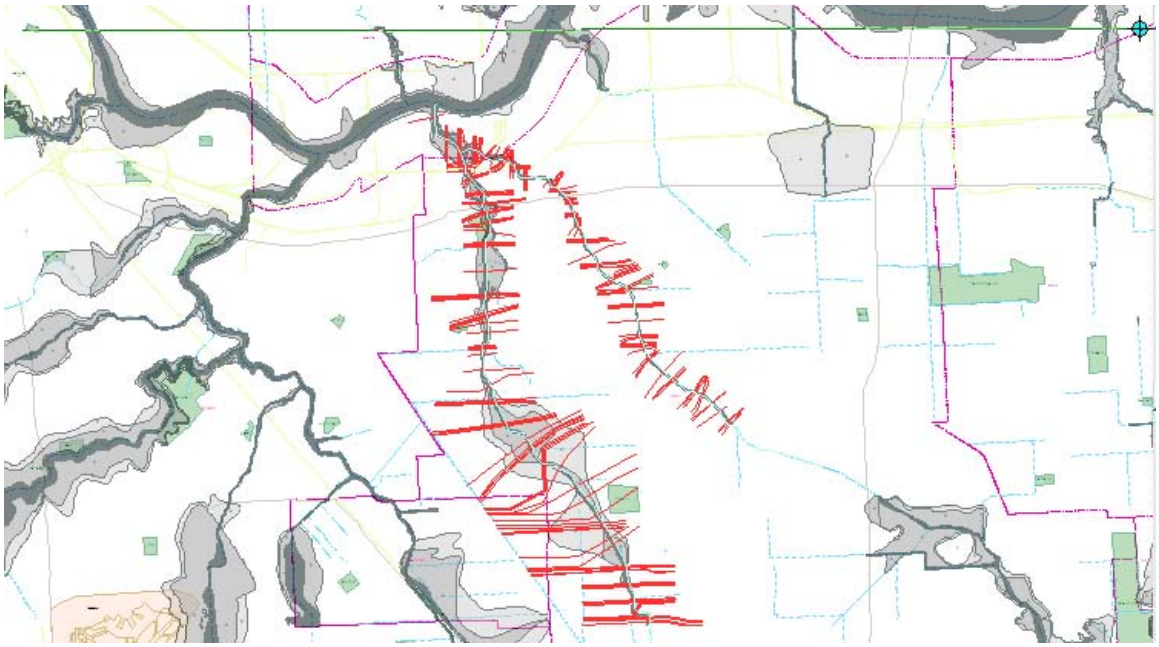
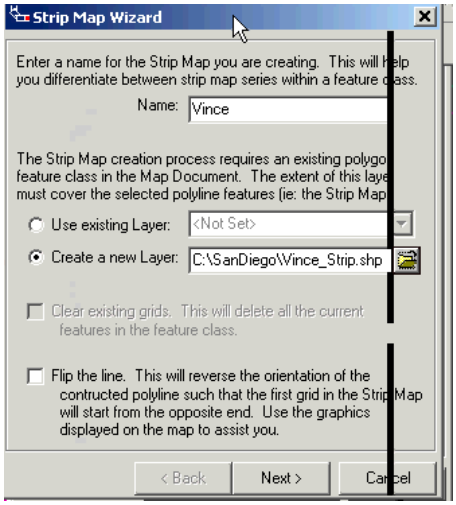


Figure 3 - Line to be used for the strip map

Step 3) Using the feature selection tool  , select the line and activate the strip map generation tool  . The strip map tool is added to the menu bar when you install map books. The purpose of the strip map tool is to create a series of polygons along a line based on the size of the data frame in your layout view. We are going to use a straight line for this sample because we are going to move the polygons to cover the area of the cross sections with overlap.
Important note: If you use a strip map with rotated polygons, you cannot use an image catalog for your photos. The images in the catalog will not rotate. You can add each image to the project and group them together as a work around.
The shot below shows the strip map tool dialog boxes and our selections.



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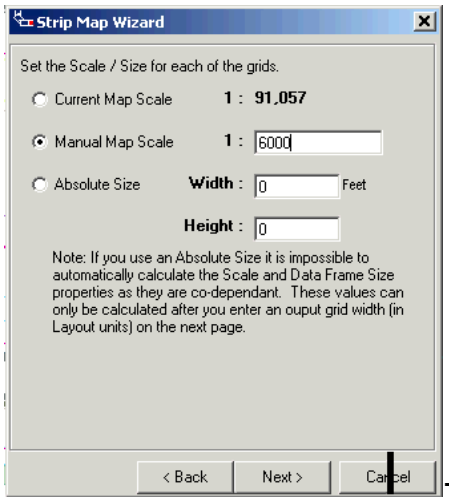

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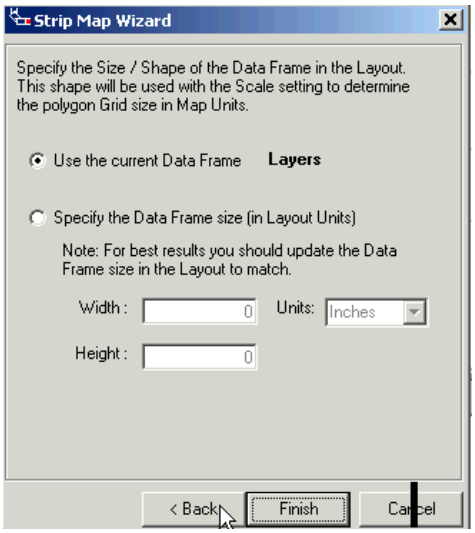
Dialog 1

Dialog 2



Dialog 3

In Dialog box 1, the name field determines the value for the map series. It will be the prefix assigned to every map sheet. The Create layer box is the name of the polygon file to contain the sheet layout.

Dialog 2 shows the scaling options, we elected to make all of our sheets 1”=500’ so we used the 1:6000 scale.

Finally in Dialog 3 we define the data frame to be used to create the sheet layout. The strip map tool will then create the sheet index in a matter of seconds. The polygon shapefile (Vince_Strip.shp) will be added to the project. The screenshot below shows the sheet layout created by the strip map tool, after a little resymbolization.

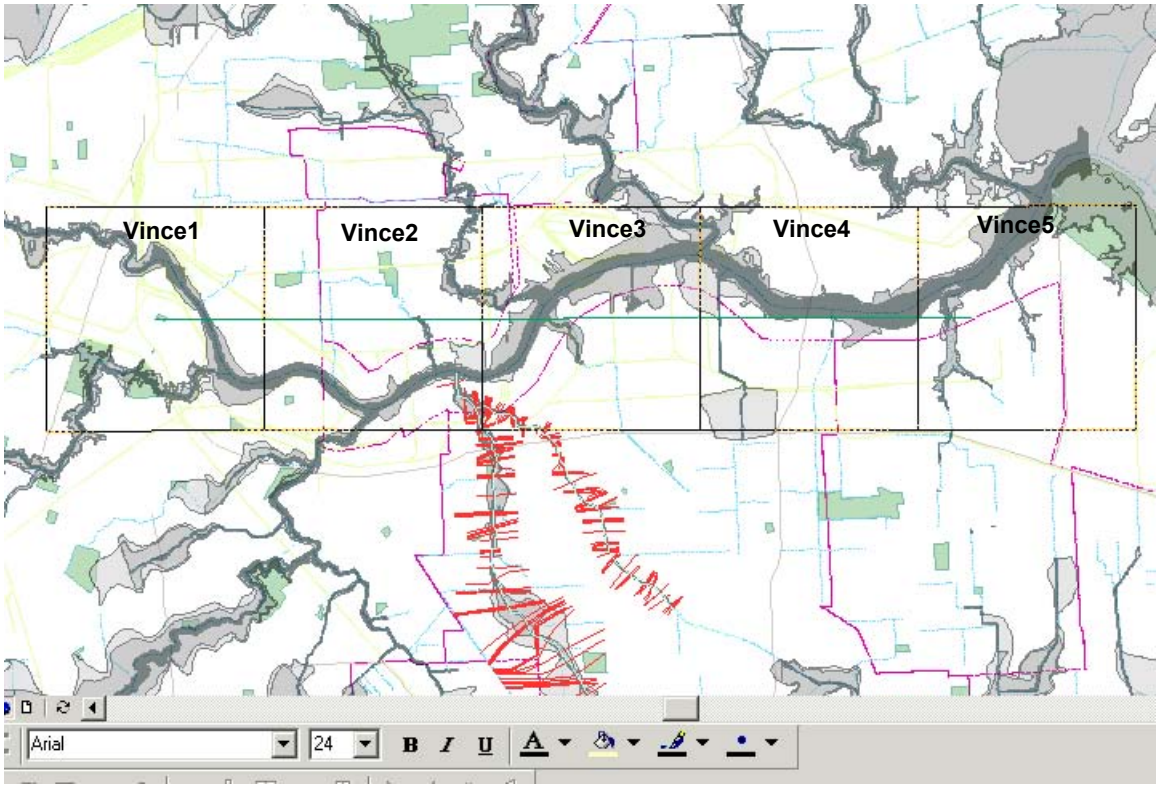


Figure 4 - Strip map created by the strip map wizard

Step 4) Start the editor and reposition each polygon to the desired location. You can also open the attribute table and edit the sheet names. We found that changing Vince1 to Vince01, Vince2 to Vince02… helped maintain the correct sheet order when more than 10 sheets were needed. In this example we did not need sheet 5, so we simply deleted the shape. The following screen shot shows the sheets after they have been moved to their desired position.

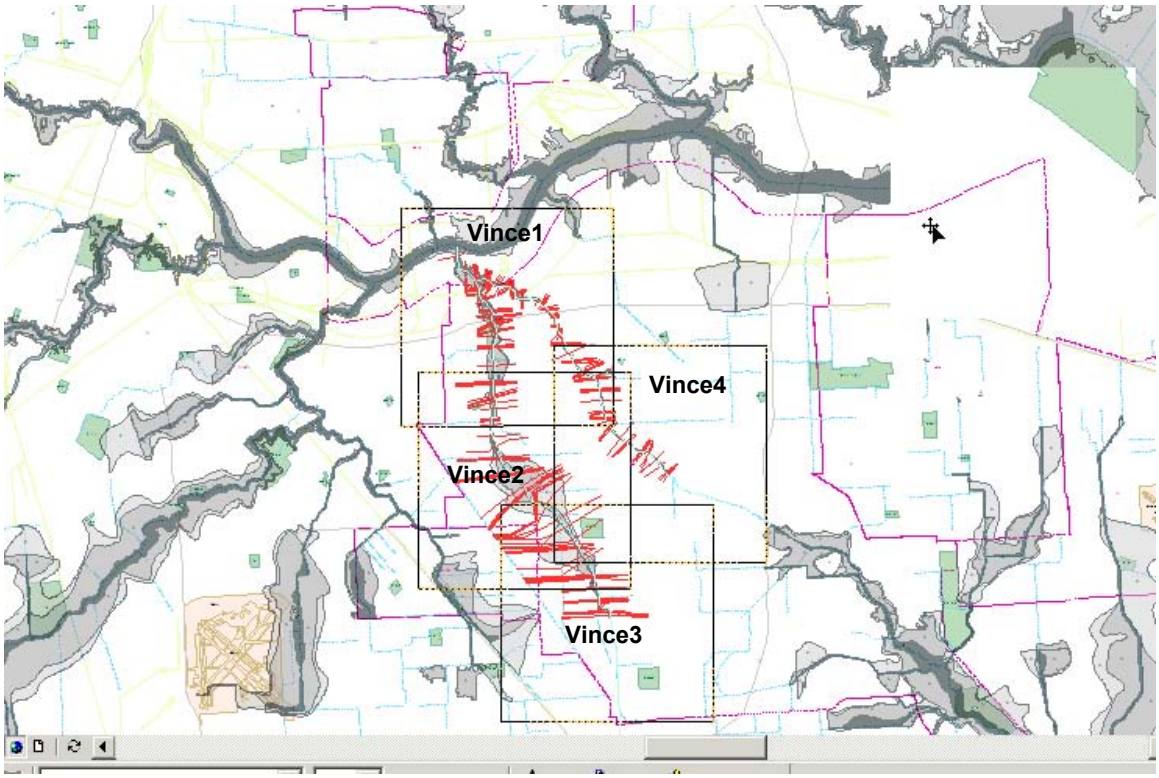


Figure 5 - Sheet layout after moving the polygons

Step 5) Preparing the layout. Change your view to the layout view and add logos and legends. All of the sheets created will use this layout. The nice thing about this layout is that any change made in the layout will be reflected on all sheets. You will not have to make the changes on every sheet. The screen shot below shows the layout used for this sample.

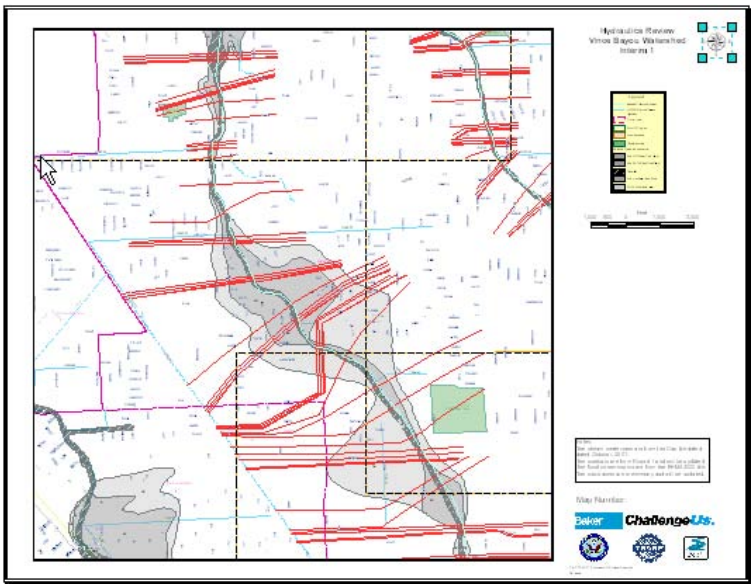
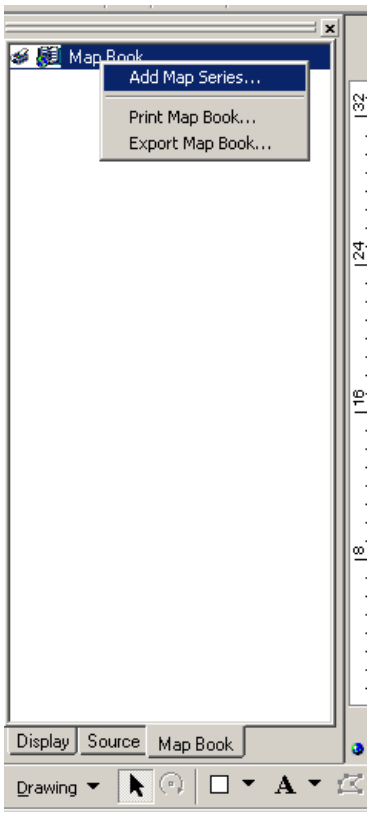
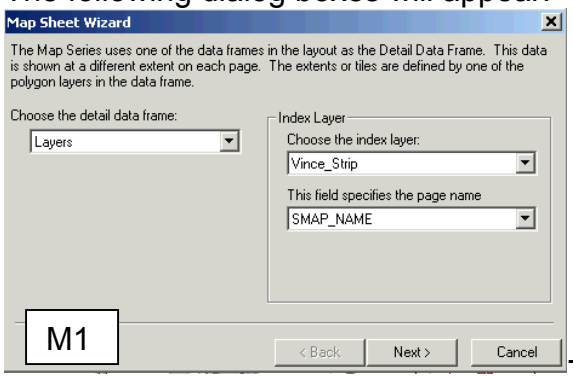


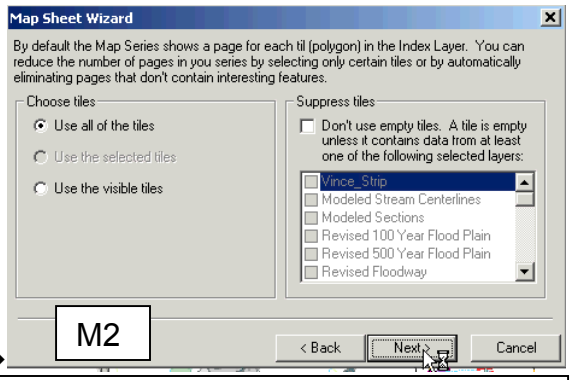
Figure 6 - Layout used for this sample

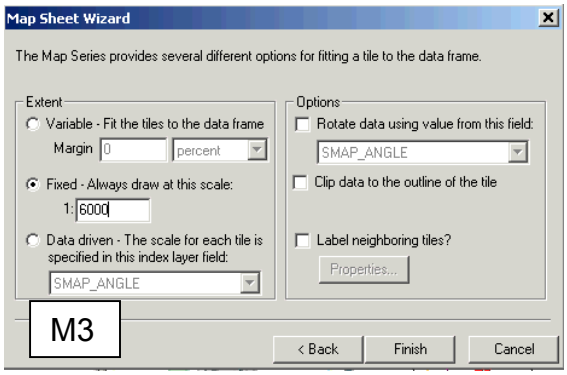
Step 6) Create the map series from the polygons using map books by right clicking the map book icon in the map book table of contents as shown below.



The following dialog boxes will appear:







Dialog M1 establishes the data frame to be used and the polygon file. Dialog M2 is very handy when you want to only create sheets containing specific data. Dialog M3 allows you to control the scaling, placement, rotation and labeling of the sheets. Click finish and the sheets will be created in seconds.

The map series will show up as a table of contents on the left of the view in the map books pane. Simply click on the sheet you wish to go to and it will open that sheet. Figure 7 shows the map series and a sheet in layout view.

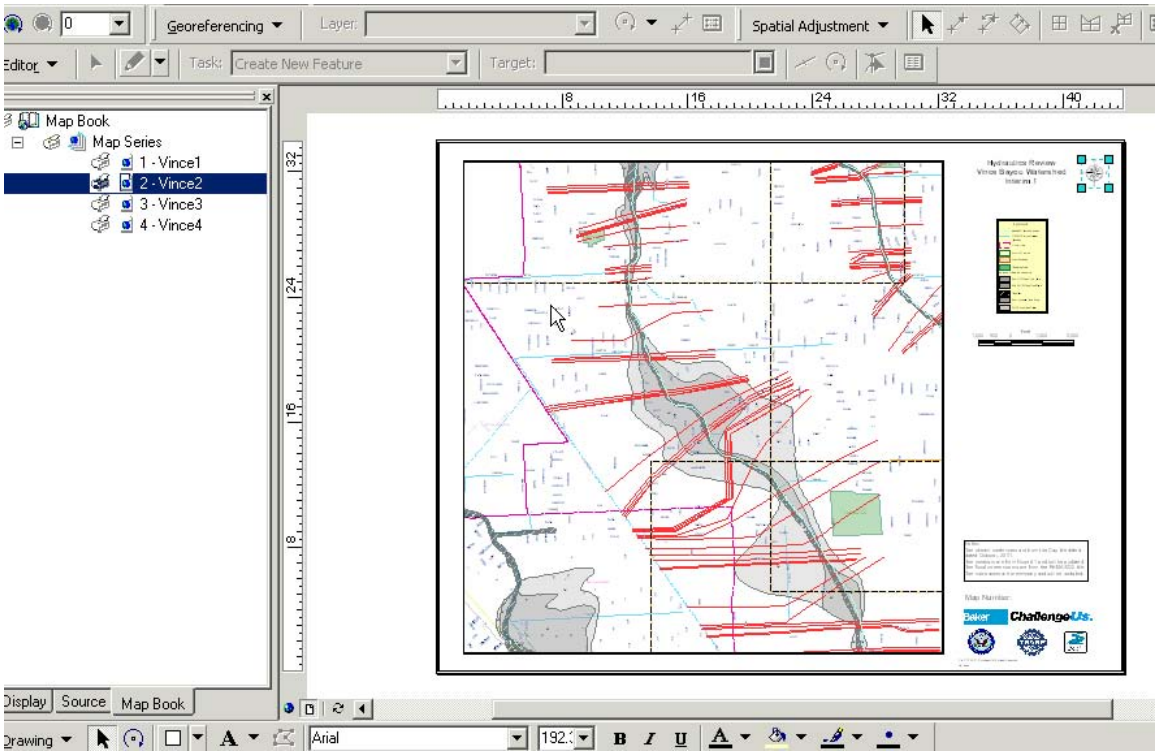


Figure 7 - Map series and the layout view

Step 7) Now we add the automated text for the map name and date. Automated text is text that will change automatically for each sheet. The map name is one and the date string for the current date is the other one. First you enter a text string with the correct font and location. Select the title text with the graphics selection tool  . Right click the Map Series heading and click on the “Tag as Date” or “Tag as Title” menu item as shown below.

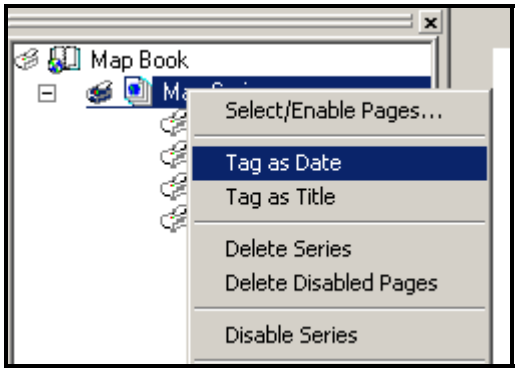


Figure 8 - Automated text

Step 9) Add the sheet location indicators. These indicators show the sheet location relative to the other sheets and project features and are similar to vicinity maps that identify project locations. They automatically change for each sheet. There are local and global indicators and we have chosen to use both. The Global indicator show the map series relative to the county and the local indicator shows the sheet relative to the other sheets in the series. To add an indicator, click on the Indicator tool and then select Local or Global from the dialog box. Then using the mouse and holding down the left mouse button, drag a rectangle to define the area you wish put the indicator. The indicators will be added as separate data frames to your ArcMap project and can be modified like any other data frame. Add the layers for each indicator and change the selection symbology on the identifier on the local indicator to show a hatch patter for the selected sheet. We also enabled extent rectangles on the global indicator to show the outline of the extent of the local indicator. The screen shot below shows the finished map with all of the required layers turned on and the indicators on the right hand side of the page.

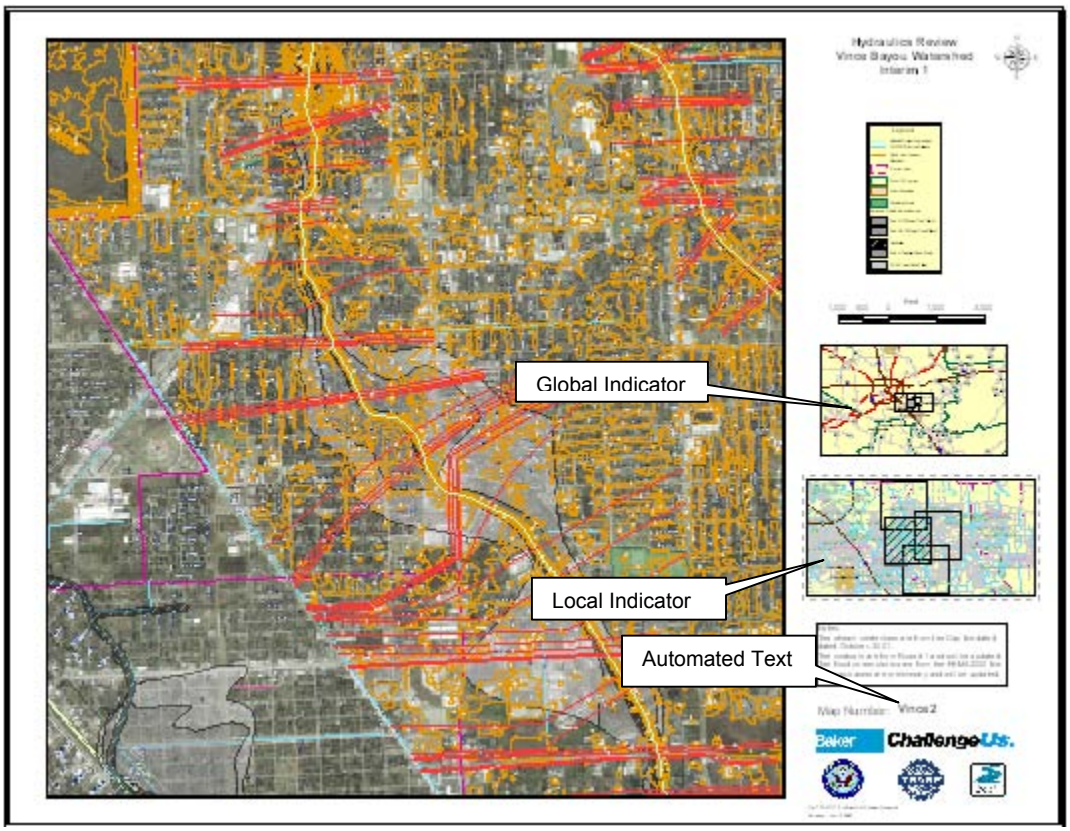


Figure 9 - Finished Map with indicators

Step 10)
Export the series to PDF. We found that plotting out each of 34”x44” sheets is not only time consuming, but in many cases not necessary. The engineers reviewing the hydraulics needed to compare the sections and the models and we found that we could do it on screen using PDF files instead of plots. This is easy to do in ArcMap, but this process does not go as quickly as creating the maps. To export the entire map series or selected sheets, right click the Map Series heading and select Export Series as shown below. *Note: Please save your project before exporting. The export can take hours based on the number of sheets, resolution and sheet size.*

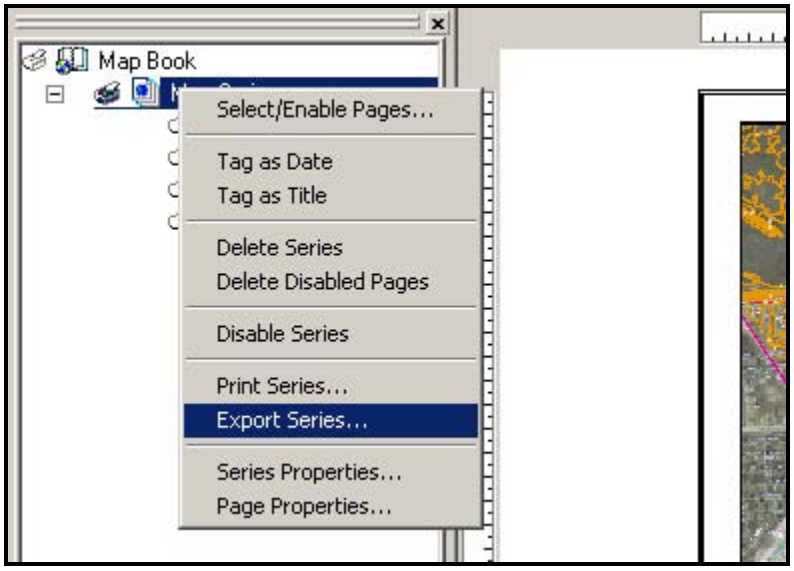


Figure 10 - Export Map Series

Individual sheets can be printed, disabled or deleted by right clicking the sheet as shown below.

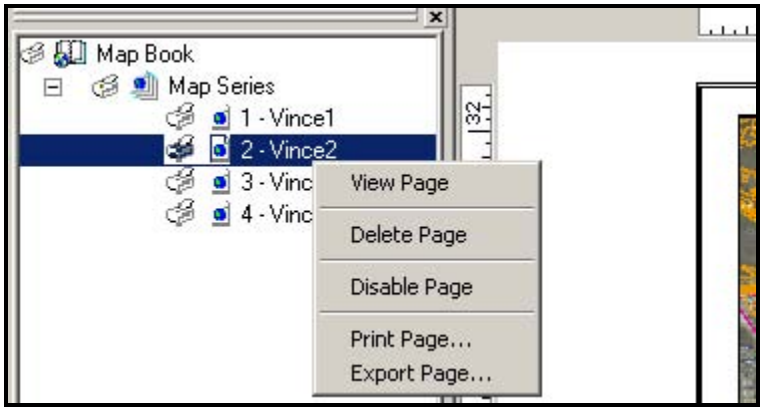
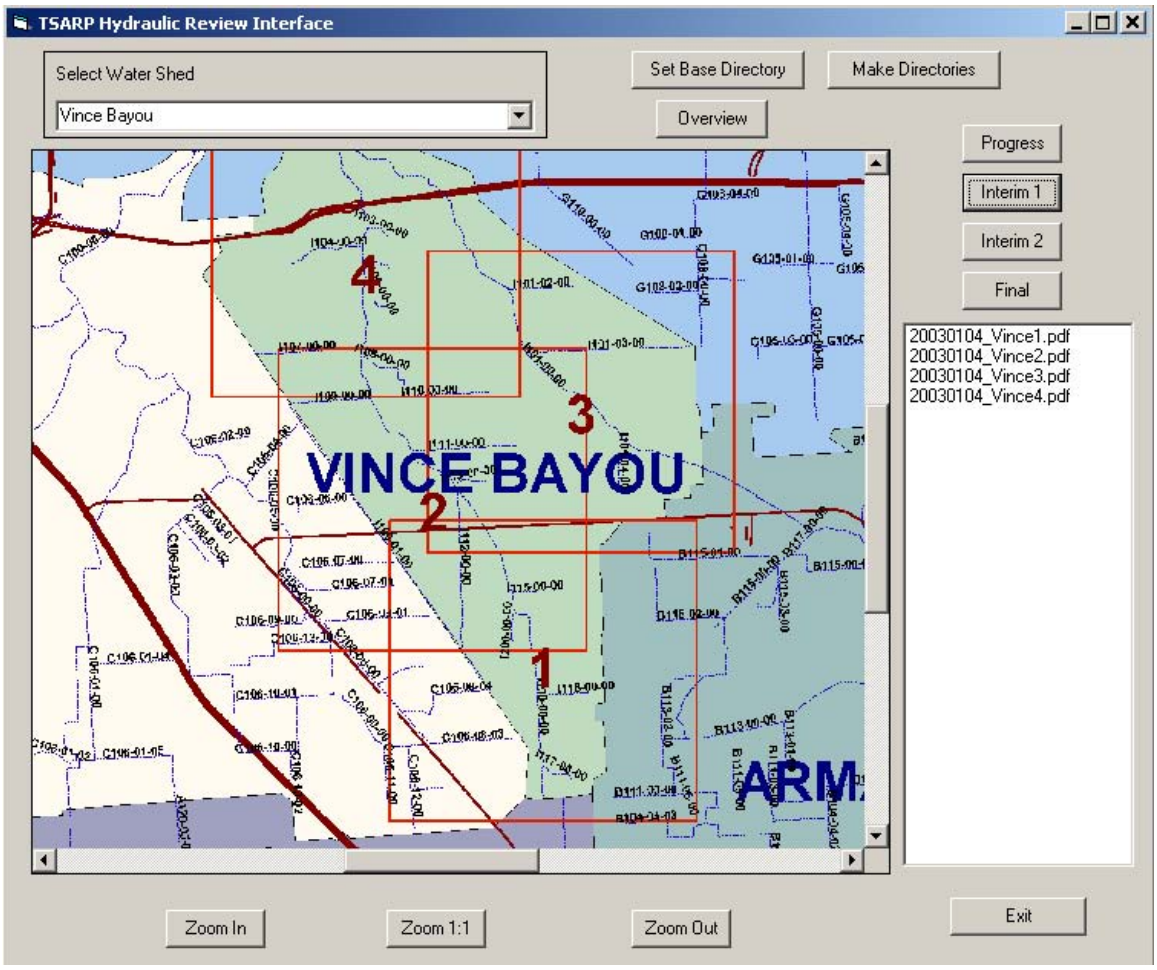


Figure 11 - Map Page Options

Step 11) How do we handle thousands of PDF maps? We have written a Visual Basic interface for the engineers to use to access the maps based on watershed and submittal type. After the reviewer selects the watershed and submittal type the list box on the right shows all of the maps that meet that criteria. They then click on the PDF name in the list box and the PDF file is displayed on their screen. Proper organization of the directory and file structures was critical to provide a mapping system that can be easily transported to different organizations in different locations. It saved time by allowing us to electronically send the maps to consultants and co-workers in other locations. It saved time and money on plotting because the engineers can plot only the maps that they need to. A screen shot of the interface is shown below.



Summary) MapBooks allowed our team to meet the incredibly tight schedule by providing the tools required to create maps fast and put them in an format that everyone could use. We are able to provide our engineering staff with the maps they needed in less than a day. Thanks ESRI!