



A DIVISION OF HYDRO, LLC

HYDROLOGIC ANALYSIS  
FOR  
TWELVEMILE CREEK  
MOBILE, AL

The Twelvemile Creek watershed is located within the western portion of the Mobile, Alabama city limits approximately 6 miles north of Tillmans Corner (Figure 1). A hydrologic model was developed in order to determine discharges throughout the watershed. The Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model was used for the analysis.

**THE STREAM**

The drainage area of Twelvemile Creek to the mouth of Spring Hill Lake is approximately 2.9 square miles. The stream drains an area that is comprised mostly of residential and commercial development. The main channel varies along the study reach. Upstream of Hillcrest Road the channel is natural, between Hillcrest Road and East Road it is paved, and downstream it returns to a natural channel with some riprapped areas. The floodplain consists of woods and residential areas. The stream is in a detailed FEMA study with a floodway.

**HYDROLOGIC MODEL**

An estimate of peak discharges for Twelvemile Creek was determined using the Gridded Surface Subsurface Hydrologic Analysis (GSSHA) model (Figure 3). GSSHA is developed and maintained by the US Army Engineer Research and Development Center (ERDC) Hydrologic Modeling Branch. GSSHA is a physically-based, distributed parameter hydrologic model with 2D overland flow, 1D stream flow, and 1D infiltration. Parameters used to generate a GSSHA simulation include precipitation data, digital terrain data, land use data, and soils data. The GSSHA model is divided into thousands of grid cells, with each cell describing runoff and infiltration.

---

**Auburn Location**

P.O. Box 2889      Office: (334) 466-0894  
Auburn, Alabama 36831-2889      Fax: (334) 466-0989

Principal Engineer: John E. Curry, PE



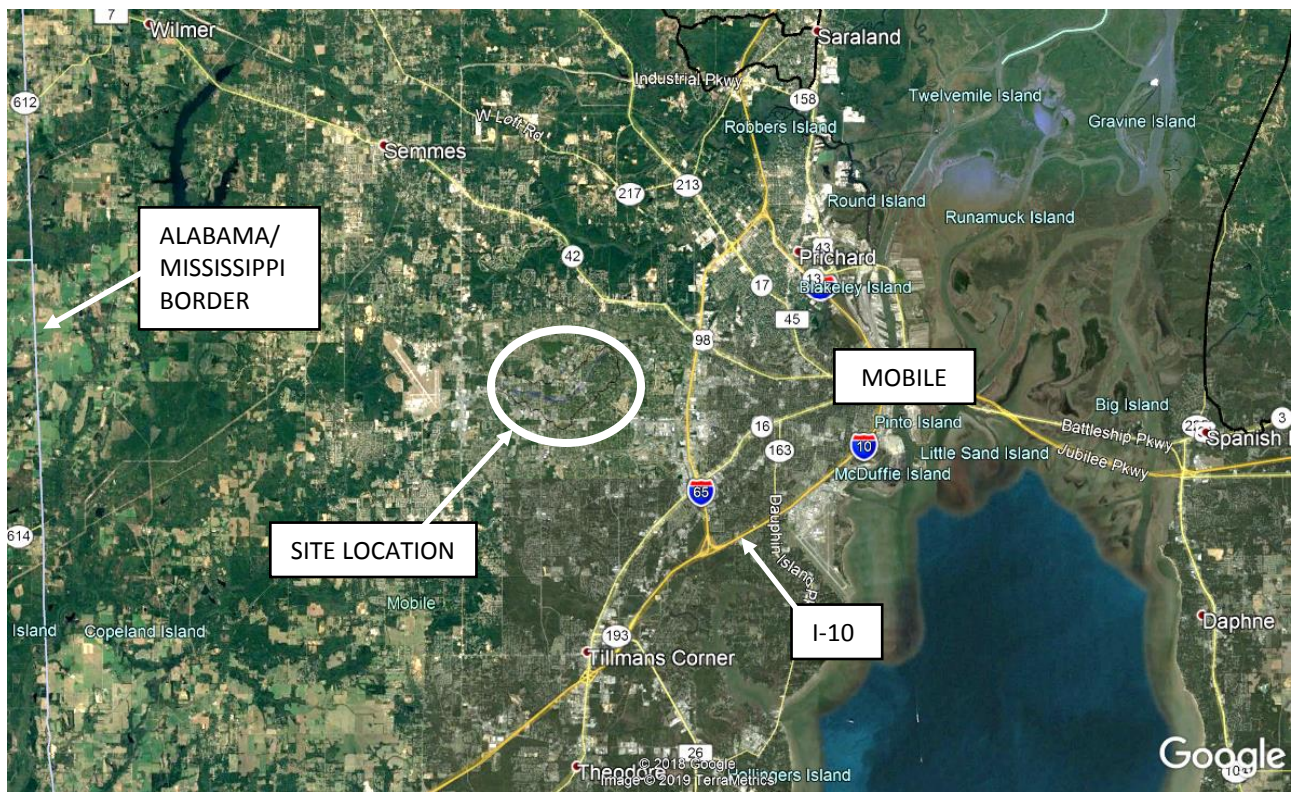


Figure 1. Google earth image with the location of Twelvemile Creek watershed

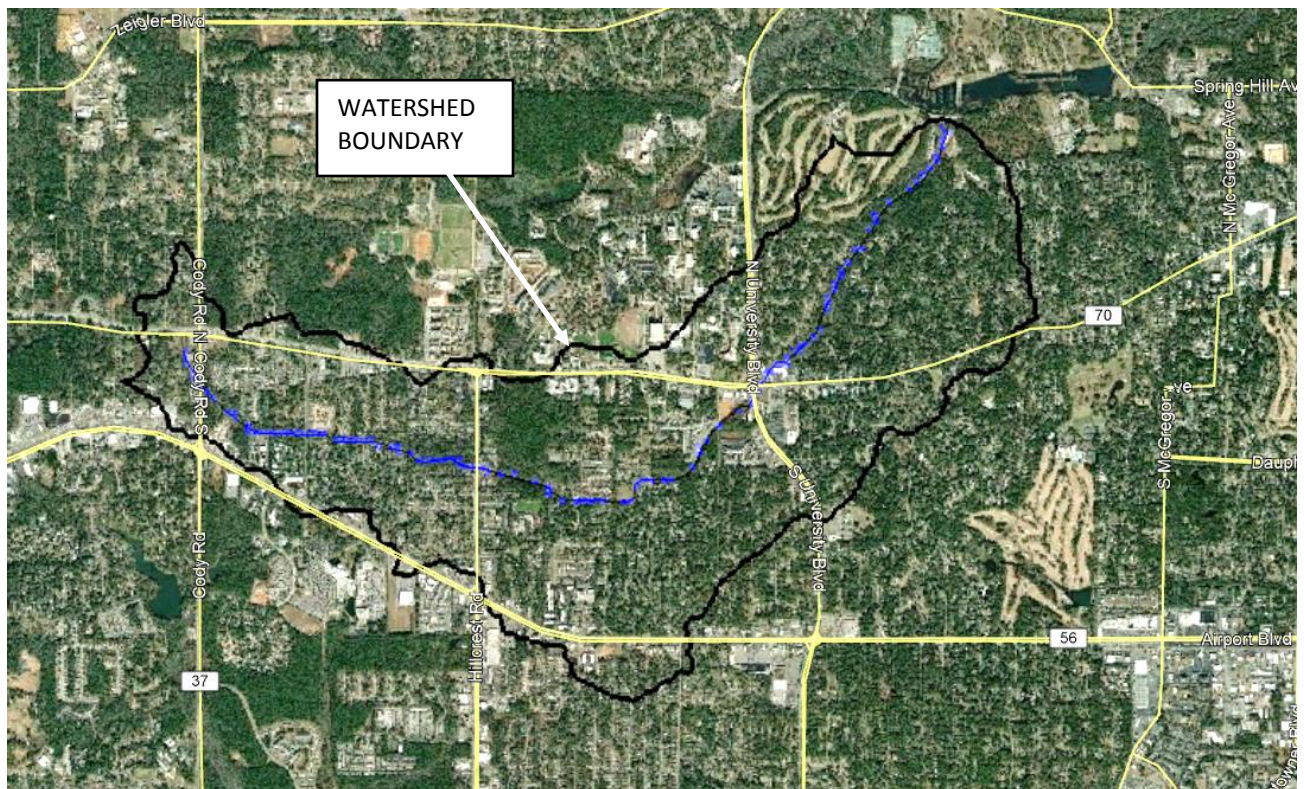
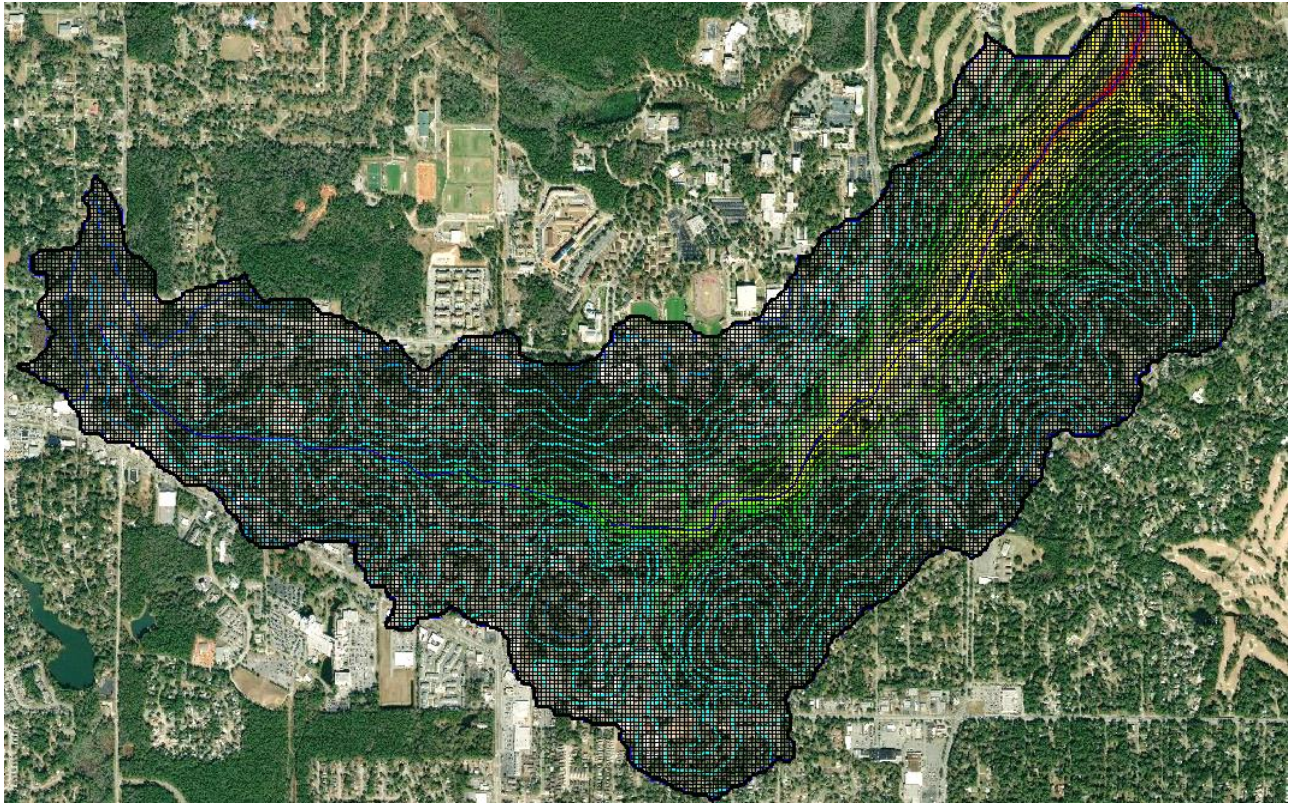


Figure 2. Google earth image with Twelvemile Creek watershed boundary





**Figure 3. Aerial image with gridded watershed indicating elevation contours**

Once the data has been incorporated into the model, the model is divided into individual grid cells (Figure 3). The downstream most point of the model was taken at the mouth of Spring Hill Lake. For this model, the basin utilized an 18 meter by 18 meter grid cell size. Over the entire watershed this generates approximately 23,150 grid cells.

Once the model is built and run, discharges can be determined at any point along the stream arc. Some of the areas of interest include the crossings at Dickens Ferry Road, Foreman Road, and Hillcrest Road. Peak discharges and hydrograph timing were determined using the rain event from October 22, 2017. The rainfall distribution was obtained from the South Alabama Mesonet (USA Campus West gauge). Stream stages approximately 20' upstream of the University Boulevard culvert were determined from a gauge installed by Integrated Science and Engineering, Inc.

The Hydrologic Engineering Center – River Analysis System (HEC-RAS) software developed by the U.S. Army Corps of Engineers Hydraulic Engineering Center was used to create a hydraulic model of the stream reach where the gauge and University Boulevard culvert are located. The hydraulic model was used for developing a rating curve for determining discharges based on stream stage. Figures 4, 5, and 6 indicate the stream and culvert profile, the culvert cross-section, and the channel section at the gauge. Plots of the rainfall distribution, measured stream discharges, and modeled stream discharges can be found in Figures 7 and 8.

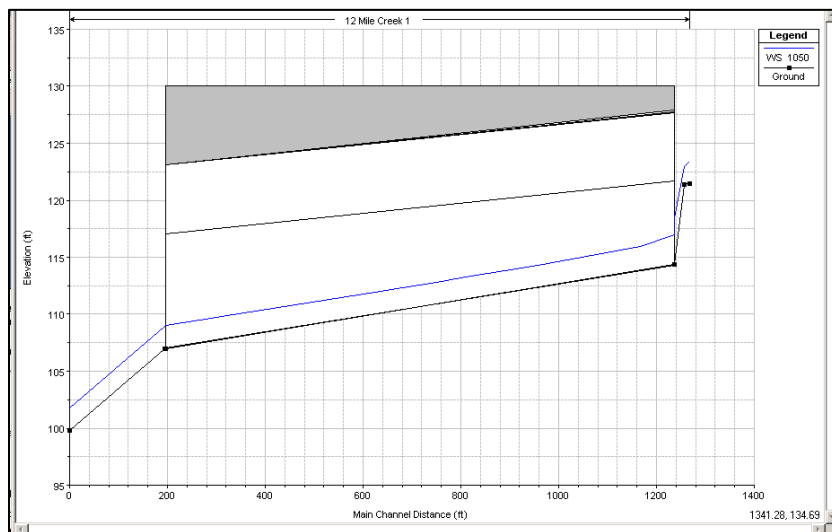


Figure 4. Schematic indicating HEC-RAS stream and culvert profile

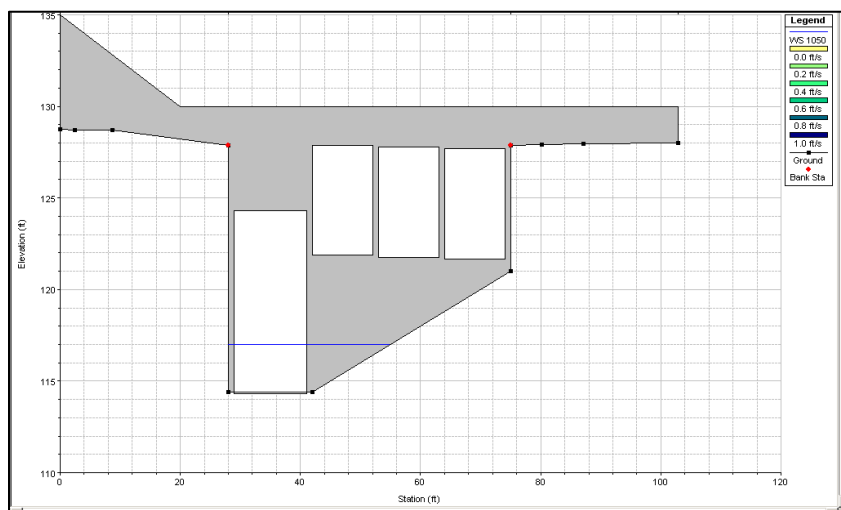


Figure 5. Schematic indicating culvert cross-section and geometry

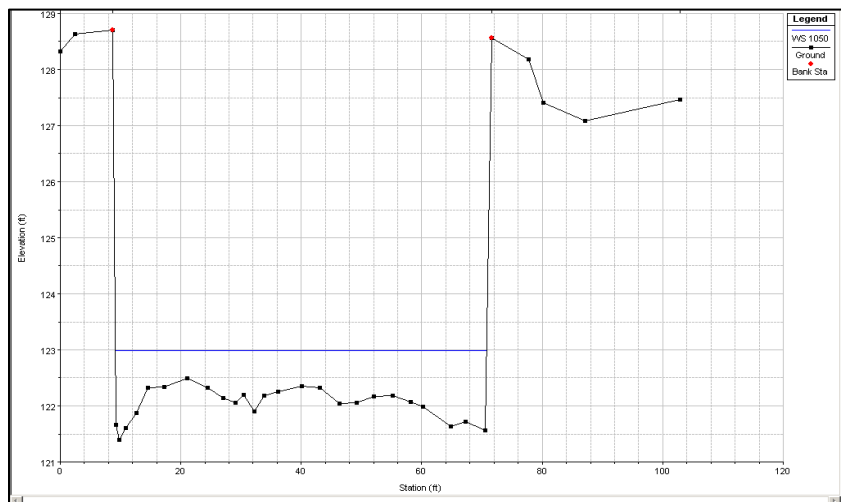


Figure 6. Schematic indicating stream cross-section at gauge location

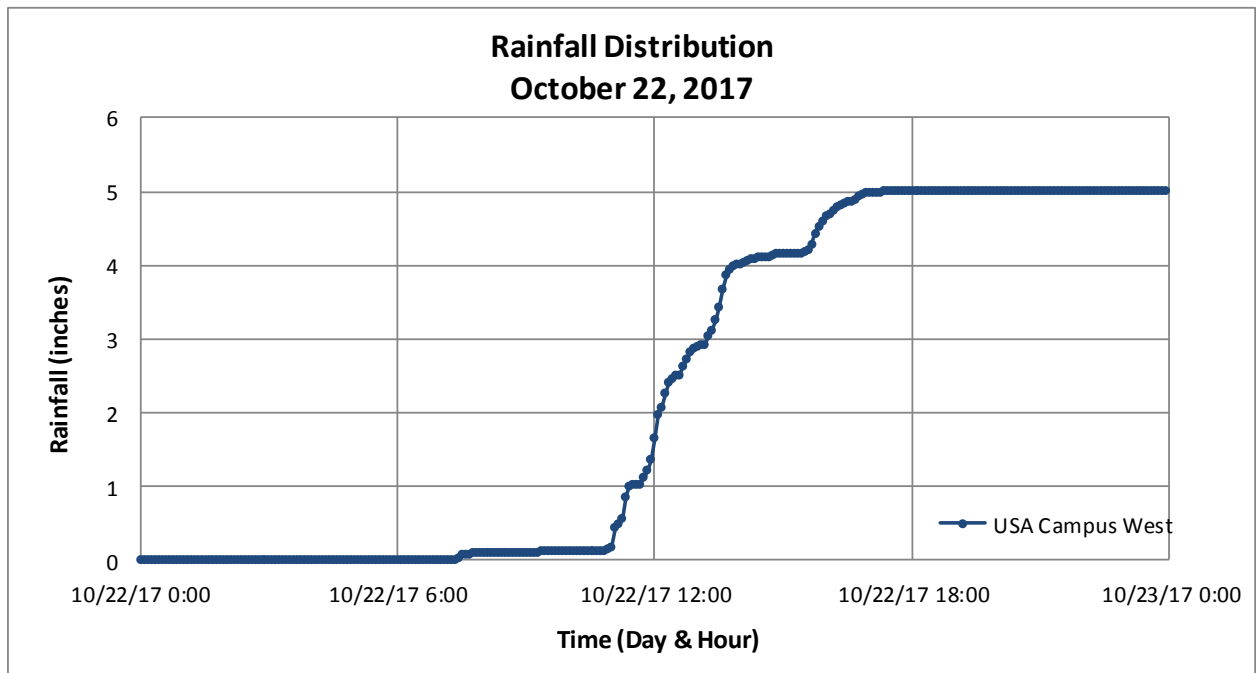


Figure 7. Schematic indicating October 22, 2017 rainfall distribution

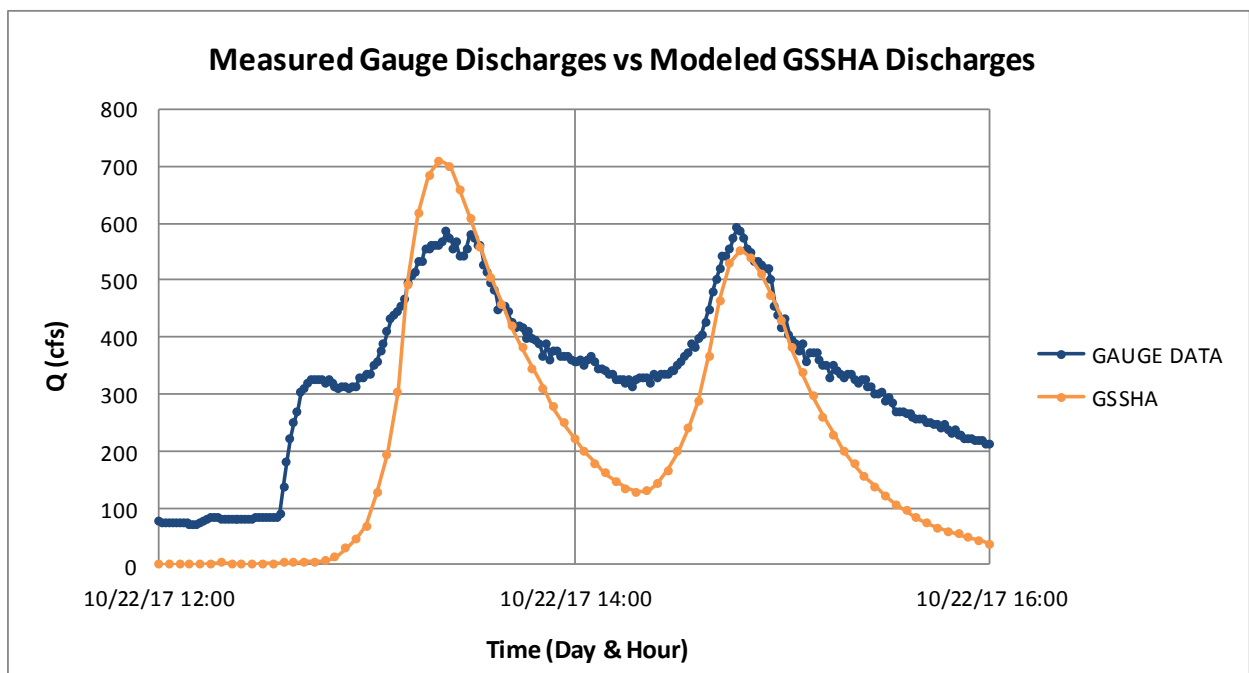


Figure 8. Schematic indicating measured discharges vs modeled discharges for October 22, 2017 event


From the rainfall distribution plot in Figure 7, it can be seen that the watershed experienced about 3.8 inches of rain in about 3 hours. According to NOAA Atlas 14 this is between a 2-year and 5-year flood event. For the larger flood events (25-year and 100-year) the model needed to be recalibrated due to the lack of a large storm in which to calibrate. The model was therefore calibrated to regression equations. Due to the amount of development within the watershed the model was calibrated to the urban regression equations. The percent developed of the watershed was determined from the USGS program StreamStats. Table 1 is a list of discharges for the October 22, 2017 event, a 25-year event, and a 100-year event at select crossings in the watershed. As mentioned previously, the model can be used to obtain discharges at any other area of interest along the stream arc.

**Table 1. Discharges at select locations in the Twelvemile Creek watershed**

Rainfall Event		Dickens Ferry Road	Foreman Road	Hillcrest Road
Oct 22, 2017		74	128	349
25 Year – 24 Hour		504	823	1571
100 Year – 24 Hour		643	990	1953

09 / 20 / 19  
 Date



  
 Charles J Thomas, P.E.  
 Senior Engineer