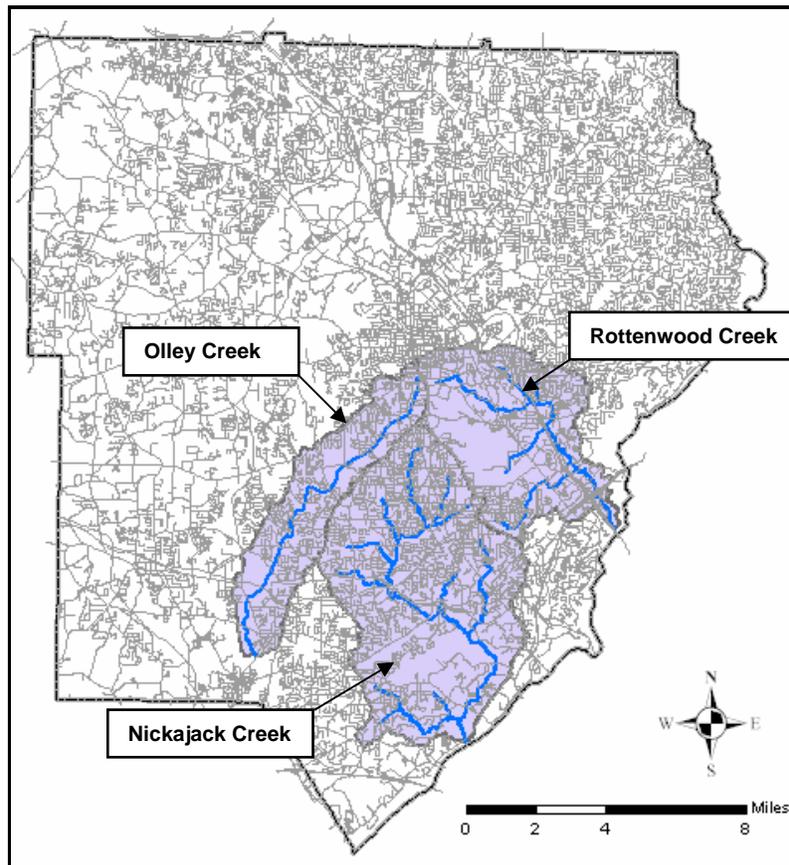


## Pilot Application of Automated Floodplain Generator Tool For Priority Area 3 of Cobb County, Georgia

By Steve Jencen, PE, CFM; Elizabeth Krousel, PE; and Darren Baird, PE  
AMEC Earth and Environmental, Inc.

### ABSTRACT

The Cobb County Stormwater Management Division hired AMEC to apply our Automated Floodplain Generator (AFG) tool to create floodplains and elevations for compliance with the “Model Floodplain Management / Flood Damage Prevention Ordinance”. This ordinance was created by the Metropolitan North Georgia Water Planning District (MNGWPD) to protect public safety, minimize both public and private losses due to potential flooding from stormwater runoff, and protect the floodplain functions that manage water quantity and quality. A pilot area was selected for study and includes streams within the Olley Creek, Rottenwood Creek and Nickajack Creek Watersheds (referred to as Priority Area Three by Cobb County).



### Figure 1. Cobb County Priority Area Three

The model ordinance was designed for adoption by communities within the MNGWPD (including Cobb County and incorporated areas within Cobb County such as the City of Marietta) with regulation occurring during the land development review process. Several key components within the ordinance extend beyond the typical Federal Emergency Management Agency's (FEMA) regulatory requirements for floodplain management. These include:

- Establishment of a "Regulatory Flood" which is based on the future condition flows as defined in the community's land use plan. FEMA typically requires the existing condition flows be used to define floodplains.
- Application of flood hazard determinations to streams with drainage areas of 100 acres or more. FEMA guidance defines streams for flood hazard determinations as anything greater than ½ square mile for urban areas and 1 square mile for rural areas.
- Establishment of elevations for the regulation of residential and non-residential structures in and adjacent to the flood hazard areas. Typical Zone A or "non-detail studied" flood zones do not have flood elevations associated with them.

The scope of the pilot study includes: (1) Data Collection; (2) Hydrologic Analysis; (3) Hydraulic Analysis; (4) Mapping; (5) Quality Assurance/Quality Control (QA/QC) and (6) Training. For approximately 8 miles of Zone AE (detailed hydraulic study) streams, the building restriction elevations for residential and non-residential structures were mapped. In addition, for approximately 11 miles of Zone A (approximate hydraulic study) streams and 14 miles of unmapped streams, the regulatory flood (future conditions) were mapped.

### **CHALLENGES OF MEETING ORDINANCE REQUIREMENTS**

Cobb County, along with many of the other MNGWPD communities, face challenges of meeting the more stringent requirements of the ordinance since traditional hydrologic and hydraulic analyses in support of floodplain mapping are costly and stormwater management budgets are limited. To assist

Cobb County in meeting this challenge, AMEC applied the AFG on approximately 33 miles of primarily urban streams within Cobb County's Priority Area Three (Figure 1) demonstrating the cost effectiveness of this tool. The ordinance requires that Cobb County municipalities determine the regulatory, future conditions floodplain based on their land use plan, map all streams draining 100 acres or more, and establish flood elevations for residential and non-residential structures in and adjacent to flood hazard areas defined by a three- and one- foot increase in the 100-year future floodplain elevations, respectively.

Due to the unique requirements of this ordinance as compared to traditional FEMA flood studies and associated county budget constraints, a flexible approach was needed to perform the analysis accurately and cost effectively. The AFG was well suited for this type of application since it was designed to utilize the best available data without ties to any particular data source. Hydrology was easily calculated by incorporating Cobb County's existing land use plan from the Flood Insurance Study (FIS) update performed for Cobb County by AMEC in 2004 into the Georgia United States Geological Survey (USGS) regression equations. Hydraulic cross sections and floodplain maps were generated using Cobb County's five-foot contour coverage rather than a standard USGS Digital Elevation Model (DEM).

The AFG automated the process of delineating contributing drainage areas, performing regional regression equation calculations, creating three dimensional cross sections, generating HEC-RAS input files necessary to perform steady state floodplain analysis, simulating HEC-RAS models, and ultimately, delineating floodplains for each stream modeled. Geographic Information Systems (GIS) data was stored in an ESRI compliant geodatabase, along with supporting files (such as HEC-RAS input files) in a directory unique to that stream name to facilitate distribution of the stream models and floodplain boundaries.

## **COBB COUNTY PILOT STUDY RESULTS**

The AFG was used to determine flows at major confluences and stream headwaters, to automatically lay cross sections at a user specified distance and width, and to delineate the floodplains utilizing the same algorithms in HEC-GeoRAS. In addition, the AFG was used to locate streams draining more than 100 acres, ensuring these streams were included in the analysis as required by the ordinance.

The last phase of the pilot study involved mapping the residential and non-residential structure elevations in and near flood hazard areas. As stated previously, these elevations are defined as being three-feet above the 100-year future floodplain for residential structures and one-foot above non-residential structures. Once again the AFG was used to define floodplain extents by using its user option to specify a certain rise above the computed floodplain. Although these floodplains were developed using the regulatory, future floodplain as the baseline, engineers reviewed the results to ensure the floodplain boundaries were technically sound with respect to backwater and hydraulic connectivity as an additional QA/QC measure.

After generating the three sets of floodplains (future conditions, future conditions plus 1-foot, and future conditions plus three-feet), AMEC utilized its floodplain cleaning methodology used in FEMA Zone A flood studies to ensure the floodplains were one smooth coverage free of jagged edges. The final result of this analysis was a set of floodplains for Priority Area Three that compared very well with existing Cobb County digital elevation data and was a major improvement in terms of accuracy over existing FEMA Zone A floodplains as illustrated in Figure 2. Note that these floodplains were generated for a fraction of the cost of traditional hydrologic and hydraulic analyses in support of floodplain mapping.

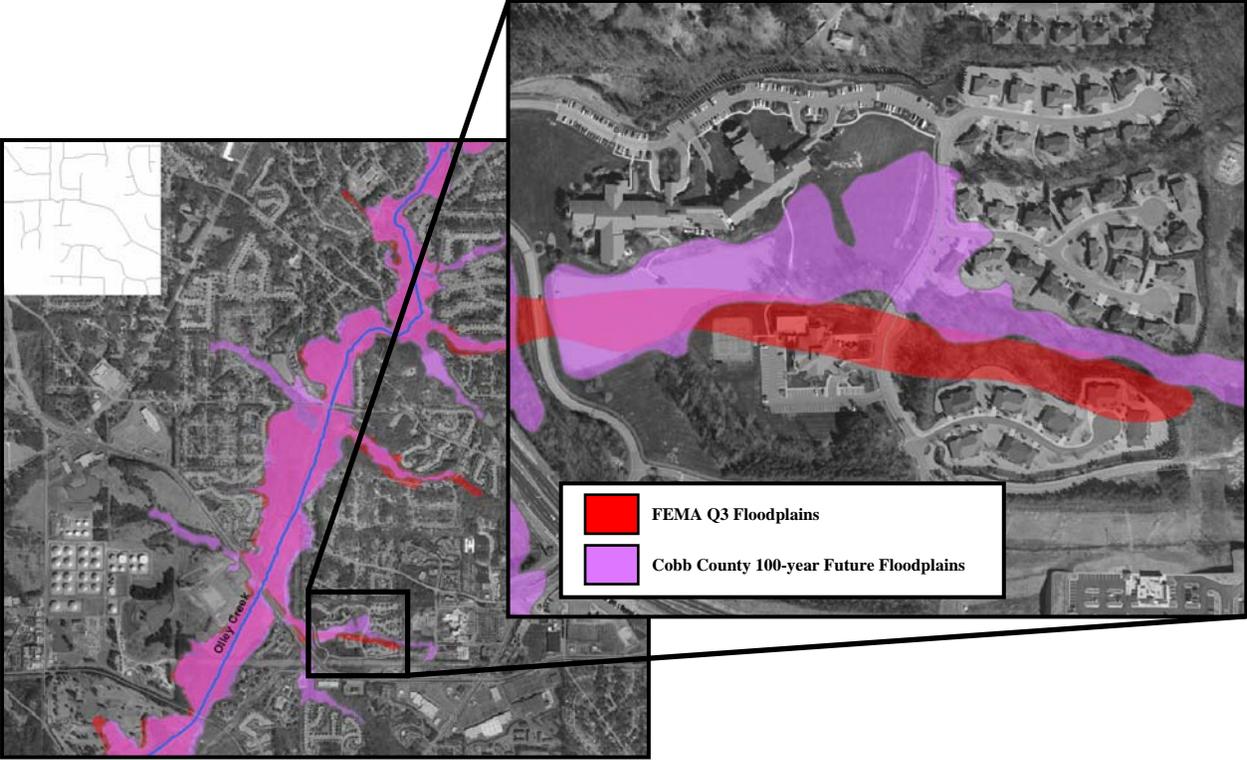


Figure 2. Floodplain comparison to FEMA Q3 Data.