

## **Floodplain Mapping: Planning for Disasters or Planning Disasters?**

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### **Presentation Information**

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### **Abstract**

As communities throughout the U.S. become more sophisticated and fiscally reliable, the Federal Emergency Management Agency (FEMA) is looking to partner with local governments. In 1999, Hillsborough County, Florida, became a Cooperating Technical Partner with FEMA in an endeavor to update and modernize Flood Insurance Rate Maps with the goal of having the County be responsible for a majority of its floodplain mapping and management activities. In the spring of 2004, the County will present draft maps to 1 million residents, overcoming numerous obstacles along the way. This paper will demonstrate the lessons learned that may be used by other governments or regional groups planning to modernize flood maps, as well as show how this map modernization process is becoming the cornerstone for many of the County's multi-million dollar mapping activities.

## **Introduction**

In 1997, El Nino pounded areas of Hillsborough County, FL with torrential rains. The deluge began in September of that year and then returned with greater fervor throughout the period of December 1997 to March 1998. The flooding that resulted from the 1997-1998 El Nino caused the County to consider updating the Federal Emergency Management Agency's (FEMA's) Flood Insurance Rate Maps (FIRMs). The FIRMs for Hillsborough County were produced in 1979 with partial updates in the 1980s and early 1990s. FIRMs are required for Hillsborough County in order for property owners to obtain Federal flood insurance. Structures located within the FIRM's Special Flood Hazard Areas are mandated to carry flood insurance if their loan or mortgage company is tied to Federal funding in any form.

Hillsborough County, which is located on Tampa Bay, covers an area of 1,072 square miles and contains the municipalities of Tampa, Plant City, and Temple Terrace. Countywide, the population has just surpassed one million residents with construction struggling to keep pace with growth. Many of the County's structures that were flooded in El Nino were located outside of the FIRM's flood hazard areas. After talking with the FEMA Region IV office, Hillsborough County was notified that they were not scheduled for an update to the FIRMs until 2010, at the earliest. Incidentally, the County's Public Works Department began to update its Watershed Master Plans in the fall of 1998 in order to reduce the County's flood risk via facilities mapping, stormwater alternatives, and Capital Improvement Projects. In 1999, the County's staff worked closely with FEMA to illustrate the FIRMs were out of date and did not accurately reflect areas of new development and increased flood frequencies within the County. This information, in conjunction with illustrating that the County's 1998-2004 floodplain management programs would amount to more than \$100 million in projects performed, assisted in having the County scheduled for a FIRM update beginning in January 2001 (Appendix 1 illustrates the milestones throughout the County's Map Modernization Process).

## **Mapping Activity Statement #1**

The County became a Cooperating Technical Community, or CTC, in 2000 and would work with Dewberry and Davis, LLC as FEMA's mapping coordinator for Region IV (Southeast U.S.). The principal task was conducted using the County's new model data to update the Flood Insurance Study, which was then used to update the FIRMs. The anticipated end-product from FEMA was a new Flood Insurance Study and digital FIRMs (paper maps will also be provided). The unincorporated county was divided into 17 watersheds that were modeled independently by the County and six contractors. These results were then submitted to Dewberry for quality assurance and quality control (QA/QC) work and formatting to the needs of the Map Modernization guidelines. If things went well, the preliminary maps were to be made public in the 2002-2003 timeframe. Hillsborough County's Hazard Mitigation Section of the Planning and Growth Management Department was designated the liaison with FEMA and project coordinator for the many activities that would span the departments of Public Works, Real Estate, Public Safety, Communications, Information Technology Services, and Planning and Growth Management. The services that needed to be performed by the County, besides the watershed modeling, included additional QA/QC work, coordinating administrative activities between all municipalities, and creating an outreach program.

### **Close Scrutiny Brings Questions**

Several of Hillsborough County's neighboring communities have recently gone through the previous version of FEMA's map revision process. When it was over, the communities had very lengthy appeal proceedings and the confusion (along with the new results) left many members of the public and industry with a bad taste in their mouths. As such, Hillsborough County has worked hard to make sure that two things occurred throughout the process. The first is that the maps are as accurate and user-friendly as possible and the second is that the public and industry have representatives involved from the beginning in order to facilitate community buy-in.

The QA/QC process began on the local level with confusion. The main issue being that the original purpose of Public Works' effort was to create facilities maps and develop stormwater alternatives. Creating an updated floodplain and information for a flood insurance study was not an original goal. Therefore, parts of the Watershed Master Plan studies had to be migrated to the needs of floodplain mapping. The next issue, hinted at earlier, was that seven different groups created these models which meant tracking down procedures and methodologies between all of the groups became cumbersome. Many different technologies and methodologies began to surface once all of the models were aggregated into a countywide system. Some of the snafus that were resolved throughout the process included the following:

- Different software platforms for GIS work
- Different topography used as some vendors interpolated contours at different intervals
- Different hydro base as some used the County's water features and others used land use classifications
- Fluctuations in base flood elevations at watershed boundaries
- Cross-sections widths too narrow for use in floodway analysis at various locations

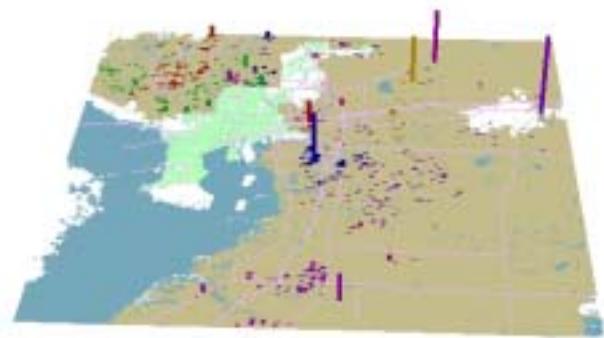
These issues were slowly derived after analysis from disparate groups. The differences have all been integrated into common denominators when necessary and resolved when questions of technical accuracy had been questioned. However, discovering these inconsistencies has slowed the process down to the point where the preliminary maps have still not been delivered to the public as of June 2004.

### **On the Brighter Side**

The fits and starts of the project have allowed the County to pursue several additional items that it would not have been able to accomplish under the previous timeframe. One of these items was to complete the floodway analysis for the County. The floodplain normally appears as somewhat of a large expansion along the riverine areas. These floodplains however, tend to be a mix of storage and conveyance areas. The County received another small grant from FEMA, known as Mapping Activity Statement #2, to map conveyance areas for the remaining riverine systems that were not mapped during MAS #1 due to technical and budget constraints. These mapped conveyance areas will help intake staff and property owners to know what engineering analysis needs to be performed for their structure.

In addition, the extra time allowed for the County to perform some further analyses to try and minimize public dissent. The actual 2D floodplain delineation is primarily created by a combination of the model output and topographic data. Most of the contours available for this

project are still about 20 years old (however, the County is in year four of a 6-year project to have 1-foot contours based on densifying ground monuments) and inevitably with floodplain mapping there is a macro-micro issue of the countywide floodplain versus what the floodplain looks like for a single structure. As such, the County is in the process of assessing whether lots placed into the floodplain for the first time via the updated model may be removed if better data is available. As part of the planning effort, the County has reviewed parcel files from the Property Appraiser's geographic information systems and performed an analysis to see what parcels are in the Special Flood Hazard Area (SFHA) according to the FEMA Q3 files and what parcels are in the SFHA according to the new model. This has shown about 22,000 parcels being added to the SFHA and 20,000 being removed. The County has gone to the added expense of hiring a temporary employee and a consulting firm, URS, to work directly with the County and FEMA's (Region IV) mapping contractor, Dewberry, to perform additional analyses. These groups have been hired to review the subdivision lot-grading plans for the areas that are being added to the SFHA for the first time via the new data. Preliminary work has shown that many plans indicate pads (if not the whole lot) as being above the new base flood elevations provided by the model. Many of the subdivisions impacted are fairly recent (since 1990) and developers placed the lots well above the existing base flood elevations.



Subdivisions, shown with extruded lines by parcels affected, added to the floodplain for the first time based on new model data. These became targeted subdivisions for review and potential outreach locations since the County would anticipate calls and confusion from these areas.

## Challenges Remain as Implementation Approaches

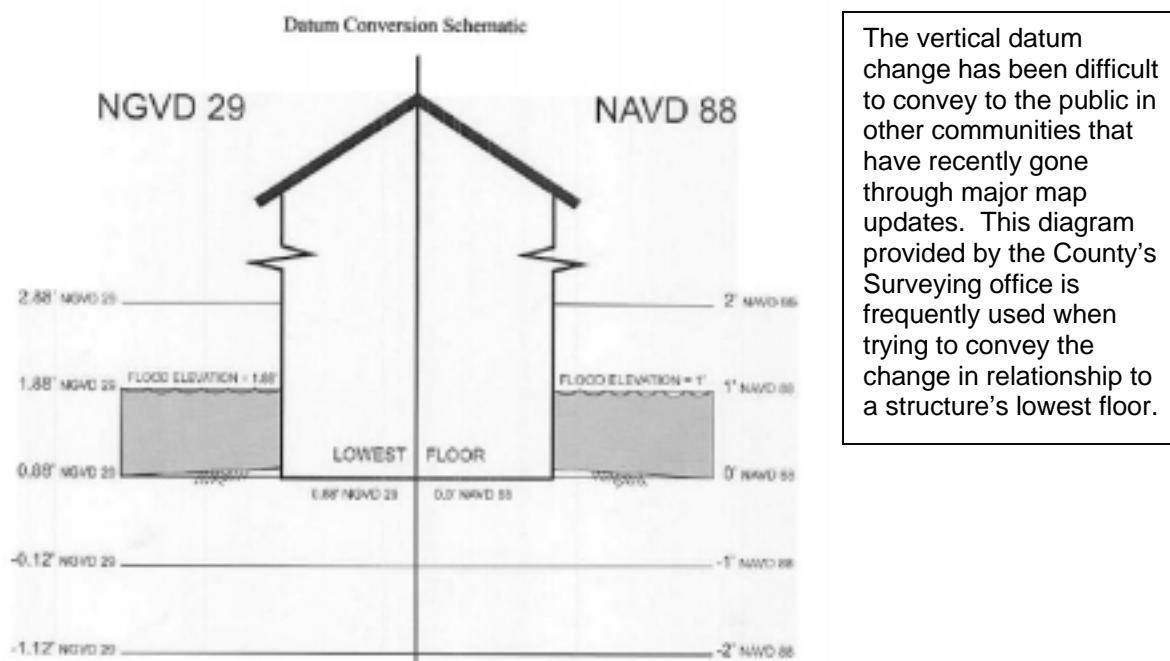
### *Floodways and Conveyance Areas*

Most areas of floodplain along major rivers and streams have an area that is designated as regulatory floodway. Basically, this is an area that will have new water sitting on top of the current river/stream in the flooding event. Therefore, the water has a higher velocity and damage potential than water just gradually flowing over the land. Construction in the regulatory floodplain is held to a higher standard and is required to provide engineering evidence that this construction will have no impact upstream or downstream of the site. There will be about 350 additional miles of floodways modeled in this update. Customers need to provide engineering evidence which is considered costly and inconvenient by most of them. These customers will also need more attention from staff to explain the requirements and assist them through the process. It has not yet been determined if the floodways and conveyance areas will have the same appearance on the maps, but they will both be considered as floodways in the Flood Insurance Study so that engineers may easily perform their analyses.

### ***Vertical Datum Change***

The new maps will have floodplain referenced in the NAVD 88 vertical datum as opposed to the previous maps in NGVD 29. The vertical datum change affects where vertical elevations were measured from and thus will result in a different number for the same referenced point. For instance, a house that had a lowest floor at a height of 11 feet using NGVD 29 will be at a referenced height of approximately 10.2 feet using NAVD 88.

This will be a point of confusion as we reference earlier maps and elevation certificates that had data in NGVD 29. It will be easy to mix and match data with work done by insurance agents, realtors, engineers, and administrative staff (See illustration below).



### ***Digital Environment***

The new flood maps will be digital (with paper backups) and thus able to be updated more frequently as well as allow for more versatility when used in a Geographic Information System. The paper maps have always been the official maps and people are considerably more comfortable equating "paper" with "official". The new style will require that public information efforts educate all involved that the digital maps are the official document and that they will change at a much more frequent time interval as better information becomes available for use in the model.

### ***Implementation and Model Maintenance***

Map Modernization is both new to the County and to the Federal Emergency Management Agency. The maps will need to be updated as better data becomes available and/or standards change. There are no standards in place yet for how often a model should be updated and what information will need to be submitted to FEMA in order to stay in compliance. Also, FEMA

will continue to watch Hillsborough County to monitor how the maps and their associated models should be rolled out nationwide. The Southwest Florida Water Management District has recently been contracted by FEMA to perform Map Modernization for the other communities in the SWFWMD district. The County may opt to enter into an agreement with SWFWMD and FEMA for funding to create a business plan for implementation and maintenance of Flood Insurance Rate Maps.

### **Conclusion**

Hillsborough County, FL. was optimistic that new model data created from seventeen Watershed Master Plans would easily transfer into an update to the County's outdated Flood Insurance Rate Maps. This has not happened due to various technical issues that were unforeseen at the time of entering into agreement with the Federal Emergency Management Agency. Furthermore, recent FIRM updates in neighboring communities have caused the County to tread lightly and better integrate activities of all parties involved with the Map Modernization update. However, these delays have also allowed the County to utilize various GIS methodologies to proof data outputs, analyze impacts of floodplain changes, add additional model outputs, and better educate businesses and citizens. These technical difficulties and responsibilities of the Map Modernization process may not be known to communities becoming Cooperating Technical Partners and thus it is hoped that this presentation and paper will assist in those endeavors. As a final note, the preliminary maps are currently scheduled for release between September and November of 2004, which would make summer 2005 the earliest possible effective date.

## Appendix 1

### Summary of the Map Modernization Process in Hillsborough County, FL.

1997

- Heavy rains associated with tropical storms and El Nino flood the County and reveal that many structures impacted were outside of the Special Flood Hazard Area indicated on the Flood Insurance Rate Maps (FIRMs).

1998

- The Public Works Department begins the update of 17 Watershed Master Plans to be used for facilities management and the implementation of Capital Improvement Projects.

2000

- After discussions between Public Works, Planning and Growth Management, and the Emergency Management Office, the County approaches FEMA Region IV about the usage of new data compiled in the Watershed Master Plans to update the FIRMs. FEMA agrees that the maps are very out of date and unfortunately, the County is not scheduled to be restudied by them until approximately 2010.
- FEMA and the County enter into a Cooperating Technical Community (CTC) agreement where the County will supply the watershed data and FEMA will supply \$694,000 to complete technical work needed to create new FIRMs.

2001

- The CTC becomes the Cooperating Technical Partner (CTP) agreement due to changes in nomenclature at the Federal level. No changes to monetary agreements.
- The three cities also enter into Memorandums of Understanding with the County as the new maps will be countywide in nature although little changes to technical data for the cities will be incorporated (although they were asked, the cities had only several limited studies and thus most of their floodplain will appear the same for now).

2002

- The first round of QA/QC for the maps begins.
- A budget amendment is requested in the amount of \$100,000 to revise two of the watersheds that were done first and needed to be updated so that they used the same model as the rest of the watersheds.

## **Summary of the Map Modernization Process in Hillsborough County, FL. (Cont.)**

2003

- The County creates a Remap Stakeholder's Outreach Committee, consisting of citizens, businesses and County employees, to plan the best way to distribute information about Map Modernization and educate all the parties involved.
- FEMA changes from regional contractors (aka MCC's) to a National Contractor. The MCC that the County has worked with so far, Dewberry, LLC, will remain till the end through contract extensions with FEMA.
- Staff from the County meets with the General Accounting Office (GAO) to provide information on the Map Modernization process that will be used to brief members of Congress.
- The Communication Department works with PGMD to create a Public service Announcement that will run on Hillsborough Television (HTV) during the release of the "final draft" maps.
- Mapping Activity Statement #2 (MAS2) is signed between the County and FEMA (\$60,000 grant) to map conveyance areas along riverine systems and streams where floodway information was not obtainable.
- The County enters into an agreement with the URS Corporation to provide corrections to draft maps that will incorporate changes over the past three years of the process (hydrology layers and subdivision information). This agreement (\$90,000) was completed June 30, 2004.
- The Stakeholder's Outreach Committee finalizes a plan to be presented to the BOCC on how to educate citizens and businesses. This plan is also taken by partners from the insurance industry to present to other organizations throughout the state (industry councils and legislative bodies). These plans are waiting for the release dates (of the "final draft" maps) to be determined before being presented to various parties.

2004

- County attends a meeting (to provide a local perspective) with members of FEMA regions across the country and the new national contractor (Baker) to discuss outreach activities that have occurred so far in Hillsborough County and ways the process can be improved when Map Modernization is rolled out across the country.
- All technical data should be completed by early summer. This will begin the post-processing phase for Dewberry, LLC where they will create Flood Insurance Studies and hard copies of maps (backups) for the countywide maps.
- Release of preliminary maps in September-November 2004 which will start a ninety-day appeal period followed by a six-month compliance period. This means that the new maps and their regulatory requirement will not be official until summer 2005 at the earliest.

## Acknowledgements

Great thanks are in order to the many team members that have kept this program going and finding ways to improve it as the twisting path has unfolded before us. The County's Eugene Henry, Allen Groover of Dewberry,LLC, Laura Algeo of FEMA-Region IV, and Annie Roina of the Flood Map Assistance Center (currently under Dewberry, LLC), have been of great assistance in their management and professionalism throughout the Map Modernization process. Their guidance, along with County staff, have helped to determine when to slow the process down for further review and when to consolidate items to get back on track. The County's Remap Technical team, consisting of Dr. Chin-Feng Ho, Dr. Junshan Su, Shields Clark III, Bob Keim, Leslie Pierce, and Andrea Iverson, has shown its expertise in handling the many externalities that have occurred and have kept the momentum going while the County continues to work together with FEMA to create a standard Map Modernization program that can be replicated throughout the rest of the nation. It should also be noted that the Stakeholder's Outreach Committee (comprised of citizens, engineers, insurance reps, realtors, county staff and other entities touched by floodplain management) has been very helpful thus far and will be another baseline for educating citizens and businesses engaged in Map Modernization.

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