

# Runoff Review



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An official publication of the Maryland Association of Floodplain and Stormwater Managers (MAFSM)

## Don't Let Your MAFSM Membership Lapse Renew Now!

2006 was a very busy year for our Association. Many of you received a letter indicating that your membership to the Maryland Association of Floodplain and Stormwater Managers (MAFSM) has expired. We encourage your continued participation and membership in MAFSM. Renew your membership now. Visit [www.MAFSM.org](http://www.MAFSM.org) and click on "Join MAFSM."

Over the last year MAFSM:

- Held an annual conference and general membership meeting to bring floodplain and stormwater professionals together and conveyed current stormwater and floodplain news in the State of Maryland.
- Provided a field trip of local areas affected by flooding.
- Offered free or low-cost training to prepare for the Certified Floodplain Manager exam and co-sponsored a workshop on coastal issues.
- Wrote letters on behalf of the membership in support of sound floodplain management to State and Federal government officials.
- Became an official state chapter of the Association of State Floodplain Managers (ASFPM).
- Published newsletters to keep you apprised of floodplain and stormwater related news and events in Maryland.

### Renewing is easy!

#### 1. Complete the membership renewal form.

You should have received one in the mail or you can download the form at

[www.mafsm.org/pdf/membershipapp.pdf](http://www.mafsm.org/pdf/membershipapp.pdf)

#### 2. Mail payment in the form of a check or a money order. Paying through Paypal is also an option.

Mail payment to: MAFSM  
c/o Adrienne Sheldon  
849 International Drive  
Suite 320  
Linthicum, MD 21090

To join or renew as an individual, full member only, you may pay through Paypal at <http://www.mafsm.org/join.htm>. (A completed membership form is still required)

Benefits and privileges you will enjoy upon renewing your membership include:

- Continued access to reduced-fee training
- Reduced conference fees
- Access to the MAFSM publication, *Runoff Review*
- The opportunity to provide input to State leaders in our field
- The ability to provide input through the Association to national leaders
- Referrals, networking, and timely information not available to non-members
- The ability to actively participate in committees and be heard

Over the next year we are planning events to energize and educate our membership – don't miss out! We value your input and urge you to be an active member.

## Conference related news...

### October 2006 Conference

The Maryland Association of Floodplain and Stormwater Managers (MAFSM) held its Second Annual Conference and General Membership Meeting on October 18-19, 2006, at the National Wildlife Visitor's Center in Laurel, MD. The program included Certified Floodplain Manager (CFM) training, a field tour of previously flooded areas of Laurel, MD, and training on topics including No Adverse Impact floodplain management, natural and beneficial uses of floodplains, an update on the status of FEMA and the region, how Letters of Map Change are processed, the status of Maryland's Map Modernization, and a presentation and panel discussion on integrating floodplain and stormwater management review.



David Conrad of the National Wildlife Federation speaks on the natural and beneficial uses of floodplains.



Panel discussion on floodplain and stormwater management disconnects. Moderator: Terrence McGee, Washington County and Stormwater Co-Chair. Panel members: Dave Guignet, MDE; Mary Roman, URS Corp. and Stormwater Co-Chair; Martin Covington, Carroll County; Ken Pensyl, MDE

Elections were held, as well as a general membership meeting, which announced a new Board and discussed Association business.



MAFSM new BOD (from left) Jason Stick, Chair; John Joyce, Central Regional Rep.; Jen Marcy, Vice-Chair; Terry McGee, Western Regional Rep.; Necolle Maccherone, Secretary; Adrienne Sheldon, Treasurer. Mike Scott, Eastern Regional Rep. not shown.

The conference was attended by 66 professionals from government, the citizenry, and private industry. Ten people attended the field tour and the CFM training was also well attended.



Members network over breaks and lunch.

MAFSM would like to extend a heartfelt thanks to all the speakers, attendees and sponsors. Your support is greatly appreciated.

Planning for our '07 conference is underway. We are seeking member participation. If you would like to participate in planning, please contact our Program Chair, Jen Marcy at 301.210.6800 or [jkmarcy@pbsj.com](mailto:jkmarcy@pbsj.com).

### Conference 2007 Call for Abstracts

This Call for Abstracts for our October 2007 conference is for a broad range of topics dealing with floodplain and stormwater management in Maryland. Please submit abstracts and bios to Jen Marcy, Program Chair at [jkmarcy@pbsj.com](mailto:jkmarcy@pbsj.com) by **July 27, 2007**.

## Treasurer's Report

As of March 5, 2007, the Maryland Association of Floodplain and Stormwater Managers has 77 members and five corporate sponsors. We currently have \$6,564.47 in the treasury.

### MAFSM Seeking Volunteers

We are looking for volunteers to serve on our committees: Program, Membership, Public Relations & Outreach, Mapping and Technology, Mitigation, and Stormwater. Please contact Jason Stick at [jstick@ccg.carr.org](mailto:jstick@ccg.carr.org) if you are interested in helping or have any questions.

### MAFSM Writes on Funding Issues

In October of 2006, MAFSM wrote two letters to Mr. Kendl P. Philbrick, the former Secretary of the Maryland Department of the Environment (MDE) on behalf of our membership.

One letter requested that MDE take the necessary steps to assure that Comprehensive Floodplain Management Grant Program (CFMGP) and Hazard Mitigation Grant Program (HMGP) funds, important sources of local mitigation assistance, are provided to communities that are impacted by recent flooding and have applied for it. We also advocated for funding on a continuous basis each year, whether or not there is a flood Declaration.

FEMA increased funding through the Community Assistance Program (CAP) to hire an additional staff person at MDE. The second letter requested that MDE provide the matching funds required and hire at least one additional full time staff position to increase the capability of CAP.

For a copy or more information about these letters please contact Kristen Martinenza, our Outreach and Public Relations Chair at [kmmartinenza@pbsj.com](mailto:kmmartinenza@pbsj.com).

### Map Mod Feedback Sought

FEMA's Flood Map Modernization program is a multi-year effort to make floodplain maps more reliable, more available, and easier to use and update. Over the next five years, many communities will be getting new Flood Insurance

Rate Maps. Most of these will be digital maps that can be incorporated into a Geographic Information System (GIS).



The updated data and the maps will be accessible to all through a web based portal

called the Mapping Information Platform (MIP) on FEMA's website (<https://hazards.fema.gov/wps/portal>). The MIP also has a wide range of products and services being provided for mapping partners and contractors as well as end users of the maps. Some of the FEMA provided products and services on the MIP may need end user training and require enhancements to fully meet user requirements.

Accordingly, FEMA has contracted with a firm providing systems engineering and technical assistance services, to assess the effectiveness of the Map Mod program's products and services from the perspective of the end users and obtain necessary feedback to be utilized for ongoing program improvement.



This firm is seeking volunteers who have received new maps and DFIRMs to help FEMA in this effort. Persons interested in participation in this effort should contact Rahul Johri at [Rahul.Johri@apptis.com](mailto:Rahul.Johri@apptis.com) or call 703-821-5513.

This firm will select a representative sample of the volunteers and e-mail them a copy of the user feedback questions. Subsequently, a telephone interview will be scheduled at the volunteer's convenience. It is expected that the interview will take 10 – 15 minutes.

*Thank you to French Wetmore of French & Associates, Ltd. for providing this article.*

## **Stormwater Notes**

*In order to recognize the importance of stormwater issues, "Stormwater Notes" is a regular column in the Runoff Review. This issue's article has been brought to us by John Joyce, our Central Regional Representative.*

### **Low Impact Development and No Adverse Impact**



No Adverse Impact (NAI) is defined as "an approach that insures the action of any property owner, public or private, does not adversely affect the property and rights of others." The Association of State Floodplain Managers (ASFPM) promotes the concept as a solution to flooding problems not fully addressed by Federal and State regulations.

In conjunction with NAI are the environmentally sound development principles of Low Impact Development (LID). Floodplain managers realize that development anywhere in a watershed will have a potential impact on flooding downstream. As development occurs in the watershed, downstream flooding may increase. They also know that the kind of development that is often permitted is not as environmentally sound as it could be.

LID, also known as "Green Growth", or "Conservation Development", balances development with the inherent natural site features, while enhancing lot yields and reducing development costs to allow economic growth to occur in an environmentally sensitive manner. It is a win-win situation for all.

Guidelines are established that eliminate, minimize, and mitigate the root causes of development-generated impacts at the source by integrating stormwater management measures that result in an ecologically and hydrologically functional development. The goal is that runoff characteristics from the site will not be changed from predevelopment to post development. Instead of installing large stormwater management facilities at "bottom" of the development, runoff is allowed to percolate into the soil on site to recharge aquifers.

The first step in LID is "site fingerprinting". Using Geographical Information Systems (GIS) and Geographical Positioning Systems (GPS), natural characteristics of the site are inventoried and mapped. Sensitive areas such as floodplains, forested areas, wetlands, steep slopes, soils, rare and endangered species habitat, and other environmentally or historically sensitive elements are mapped. These areas are designated as "conservation areas", and the area of the site where there are no sensitive elements becomes the "buildable area". This process identifies environmental issues early in the development process and facilitates effective resource protection. This process has been used in the development of State parks for years.

Once the conservation areas are set aside and the buildable area identified, the local jurisdiction should have the flexibility to work with the developer to grant density credit for clustering and allow smaller lots to prevent sprawl. In residential/mixed use developments, this will often lead to the "village" concept, which has many additional social benefits derived from mixed types of land uses located in close proximity. Economic analysis shows these developments have higher initial lot value, appreciate faster, have lower infrastructure cost per lot, and higher tax generation than conventional development. All this is achieved while maintaining the sensitive areas in conservation easement for the good of everyone.

The core of the LID principle is the range of stormwater drainage techniques designed to keep runoff on site. The addition of the conservation areas provides more opportunities to keep runoff on site. By allowing runoff to percolate throughout the site, predevelopment hydrologic function is mimicked. Impervious surfaces are minimized to allow infiltration, while natural detention and filtration control and treat runoff at its source. This approach is often less expensive to construct and maintain compared to conventional systems.

LID techniques primarily use retention strategies. Retention delays the release of runoff by incorporating or enhancing the natural hydrological actions that filter and redistribute rainwater. The system focuses on the release of runoff through evapotranspiration and infiltration. Simple site specific practices that integrate green space, native landscaping, and natural hydrological functions to capture and treat runoff

from developed land are used, such as stormwater ponds, stormwater wetlands, bioretention areas (rain gardens, swales), infiltration devices (trenches, filter strips), green roofs, and permeable paving.

Communities derive benefits because preserved and restored open space and natural areas become community amenities, water quality is preserved, and aquifers recharged by treating stormwater on site.

In order for LID to work, subdivision, zoning, and stormwater ordinances must offer the flexibility to promote clustering and innovative community design of the site as open space to accommodate on-site stormwater management.

In addition, plans are needed for the long-term maintenance of the conservation areas and stormwater management techniques. Developers or homeowners need to provide a continuing revenue stream for common area management and a commitment to maintaining the stormwater management techniques incorporated in the design.

An excellent source on the details of how to implement LID is *Green Growth Guidelines*, prepared by the Coastal Georgia Regional Development Center and EMC Engineering Services, which is located at <http://crd.dnr.state.ga.us/content/printversion.aspx?Document=969>. The Low Impact Development Center is a non-profit organization dedicated to the advancement of low impact development technology located in Beltsville, MD – web: [www.lowimpactdevelopment.org](http://www.lowimpactdevelopment.org).

A community that takes an NAI approach should also be promoting, if not requiring, LID as certification that a project will not have an adverse impact on others, to protect itself from adverse legal action.

### ***An Assessment of Maryland's Vulnerability to Flood Damage Receives APA Award***

The Maryland Chapter of the American Planning Association seeks award nominations every two years. The Maryland Planning Awards recognize outstanding planning work for projects and programs in Maryland. This year, ten nominations

were selected to receive awards. The recipients were recognized at the 2006 Awards Ceremony, held on November 8, 2006. Over 60 planners and guests gathered at the Banneker-Douglass Museum in downtown Annapolis to recognize the recipients.

The award in the Public Education or Research category was presented to the Maryland Department of the Environment and Eastern Shore Regional GIS Cooperative at Salisbury University for *An Assessment of Maryland's Vulnerability to Flood Damage*. John Joyce accepted the award on behalf of MDE and the Eastern Shore Regional GIS Cooperative at Salisbury University. For a copy of the report visit [www.esrgc.org](http://www.esrgc.org).



*John Joyce of MDE and our Central Regional Rep. accepts an award for Public Education and Research for the study "An Assessment of Maryland's Vulnerability to Flood Damage" from Rich Hall of Maryland APA. The award was given to John and Michael Scott, Eastern Shore Regional GIS Cooperative, Salisbury University and our Eastern Regional Representative.*

### **Homeowners' Insurance for Maryland's Coastal Areas**

Recent news articles have suggested that Maryland homeowners with property located on or near the water and homes in general along the Eastern Shore may experience difficulties in purchasing homeowners insurance coverage. The Maryland Insurance Administration ("MIA") has been monitoring market adjustments and felt it was important to address the condition of the property and casualty market in Maryland. MIA is pleased to be able to say that the property insurance market remains healthy and there remain many fine insurers looking to write business across our state. We are not facing an availability crisis in Maryland.

The recent news that Allstate would no longer be writing new homeowners' insurance policies in various areas located near water raised concern in

Maryland as to whether Maryland citizens were going to experience difficulty in purchasing homeowners insurance. Allstate will renew its existing policies in Maryland, but is choosing to limit its coastal exposures by not taking on any new risks. Thus, Maryland is not in the position that several other states find themselves, such as South Carolina, North Carolina, Texas and New York. In these states, Allstate is neither writing new business nor is it renewing existing accounts.

Allstate is not the only property insurer that is reassessing its exposure to risk. Nationwide is adding new business only when current accounts do not renew. By this method, they intend to keep their level of exposure in Maryland constant. Also, State Farm has become more restrictive in its writings of properties located near the Atlantic Ocean.

Maryland is fortunate in that we are one of the coastal states where the catastrophe modeling does not suggest significant losses as a result of tropical storm or hurricane activity. While we are at risk, Maryland does not suffer the frequency of storm activity that South Carolina and North Carolina do; nor do we have the historical losses that Florida and Louisiana have experienced.

Maryland's property and casualty market remains healthy and competitive. While selected insurers are restricting their writing, other carriers are continuing to write new business.

The MIA also encourages citizens with homes located near bodies of water to install storm shutters, to inspect their property regularly for signs of leakage or weather exposure, and to secure all objects that are subject to being blown by the wind. Mitigation and loss prevention are key to available and affordable insurance. Additionally, it is imperative for those with property located near bodies of water to consider purchasing flood insurance.

The MIA would like to remind all citizens that regardless of who insures your home, flood damage will only be covered if you have a flood insurance policy. Based on past loss experience, Anne Arundel County, Baltimore City, Baltimore County, Dorchester County, Queen Anne's County, Talbot County and St. Mary's County are prone to flooding. According to the National Flood Insurance Program ("NFIP"), "Everyone lives in a flood zone." Indeed 25-30% of all floods occur in

low to moderate risk areas. Thus, everyone should consider purchasing flood insurance. Information on flood insurance may be obtained by going to [www.floodsmart.gov](http://www.floodsmart.gov) to learn about the NFIP, the basic coverages for structure policies and contents policies, which are separate policies and which must be purchased separately, and to obtain a quote or find a producer to purchase this insurance.

Now, more than ever before, the MIA strongly urges Maryland citizens to shop around and to obtain competitive quotes for their homeowners insurance and to consider purchasing flood insurance. Maryland citizens may benefit from publications that the MIA has available on its website such as the MIA's [Consumer Guide to Homeowner Insurance](#) and [Comparison Guide to Maryland Homeowners Insurance Rates](#), both of which provide valuable shopping data. Additionally, the MIA has a brochure entitled [An Insurance Preparedness Guide for Natural Disasters](#) which will also be beneficial for homeowners or renters regarding pre-disaster preparing and post-disaster claims processing. To access these publications, simply go to the MIA website at [www.mdinsurance.state.md.us](http://www.mdinsurance.state.md.us), click on Consumer Information and then click on publications. For those without access to the internet, copies of all MIA publications may be obtained by calling 1-800-492-6116. Finally, the MIA remains ready to assist any citizen with any insurance question they may have and we can be contacted by telephone, mail or email.

This article was shortened to accommodate the size of our newsletter. For the complete article please click: <http://www.mafsm.org/newsltrs.htm> and see Volume 2, Issue 1.

*Thank you to R. Steven Orr, Insurance Commissioner for the Maryland Insurance Administration (MIA) for providing this article. The MIA is an independent State agency that regulates Maryland's insurance industry and protects consumers by ensuring that insurance companies and health plans act in accordance with insurance laws.*

## **Developing a Flood Mitigation Plan for the City of Annapolis**

The City of Annapolis is surrounded by water on three sides, making it susceptible to flooding associated with meteorological events. Therefore, a flood mitigation plan is crucial to the well being

of the city's residents, business owners, and government.

Construction within the designated floodplain district of Annapolis is regulated by Annapolis City Code. These requirements have been in effect since the mid-1980s. Since that time, Annapolis has experienced a strong period of economic growth. It is estimated that fifty percent or more of the structures within the city have been renovated since the mid-1980s and would be expected to meet the requirements for use of flood-resistant materials and construction techniques.

In May 2006, a Planning Team from Annapolis convened to discuss the scope and scenarios for development of a flood mitigation plan. The Office of Emergency Management chairs the Planning Team with strong participation by the Department of Public Works. The Planning Team met with mitigation planning contractors. They agreed upon the following flood mitigation goals:

- Protection of human health
- Limitation of economic damages to Annapolis
- Preservation of the architectural character and historical significance of Annapolis

Then, to identify the existing flood hazard, representatives from the Department of Public Works and the Office of Emergency Management agreed upon likely flood scenarios. These scenarios were selected based on the combined professional and personal experience of these officials, who have worked and lived in the city for more than 40 years.

Entities vulnerable to flood damage were divided into three types.

The first type was identified broadly as a "structure," and includes publicly and privately owned buildings. The second type was identified broadly as "infrastructure," and includes items owned by the government or public utilities and are considered to be useful in maintaining a safe and healthy environment or facilitating commerce and economic health. The flooding of many of these type structures are not considered significant or damaging to the long term safety or health of the community. "Private property" is the third type, including property other than structures that are-owned by residents and business owners.



*Compromise street at risk structure*



*Private dock and bulkhead*

Once available mitigation options were identified, each vulnerable structure was then assigned a potential mitigation option. The Planning Team then developed preliminary mitigation actions for each of the following structures.

A workshop to involve the public was held in September of 2006. The Director of the Office of Emergency Management discussed flood and other hazard risks with residents and business owners. There was also a demonstration of the installation of a soft shoreline stabilization control. Participants learned how quickly and with minimal disruption shoreline softening can occur.



*A volunteer answers questions about soft shorelines at workshop.*

*Thank you to Carrie W. Capuco of Capuco Consulting for providing this article.*

## Disaster-Resistant University All-Hazard Mitigation Plan University of Maryland

In 2006, the University of Maryland received a grant from the Federal Emergency Management Agency (FEMA) to complete an all-hazards mitigation plan for the University's College Park campus. The grant was made available through FEMA's Pre-Disaster Mitigation (PDM) program. In addition to ensuring that UM has a good understanding of its risks, an approved mitigation plan is a prerequisite for receiving FEMA grants to carry out specific mitigation projects. The planning process is being carried out in accordance with FEMA requirements, and is guided by a small Hazard Mitigation Committee (HMC) that is comprised of representatives from various University Departments and administration.

There are several important outcomes to the mitigation planning process:

- It provides a detailed assessment of hazards, vulnerabilities and risks.
- The University will identify and prioritize mitigation projects and strategies.
- An approved plan positions UM to apply for project grants through FEMA programs.
- Mitigation principles can be integrated into other University plans.
- It will produce benefit-cost analyses that are a requirement to receive FEMA grants.

The University's flagship campus is in College Park, and comprises 1,250 acres, hundreds of buildings and highly-developed infrastructure. There are more than 35,000 students enrolled. The operation is supported by thousands of faculty and staff. It is also home to a wide array of highly specialized research infrastructure, some of which is potentially susceptible to the effects of flooding, winds and other natural hazards.

The UM HMC is using the processes established by FEMA in its series of planning "How-To" guides as the basis for developing the campus mitigation plan. The FEMA process results in a risk-based determination of effective mitigation strategies and projects that will be included in the plan.

The College Park campus is subject to a range of natural hazards prevalent in the mid-Atlantic

region, the most prominent of which are flooding and high winds. The campus has a complex and aging infrastructure, and new demands are placed on its components every year, in many cases exacerbating natural hazard risks. In order to focus further risk assessment work on its most critical assets, UM completed a ranking process based on part of the FEMA "452" methodology. All physical assets on the campus were listed, and the HMC assigned each a score based on the potential consequences of losing the asset. The resulting list (about 20 assets) is comprised of critical and high-value facilities including utilities, information technology infrastructure, and research/hazardous materials sites at various locations on the campus.

UM will next focus efforts on highly detailed characterizations for the two or three most significant hazards. This effort is based on a combination of research from a wide array of open-source documents such as FEMA Flood Insurance Studies and Rate Maps, NOAA wind data, etc., interviews with facilities managers and technical staff, and public records such as insurance claims.

Next, vulnerability assessments for key facilities, assets, and populations across the campus will be conducted. Vulnerability assessments determine the degree to which these elements may be damaged when they are exposed to hazards. One example is the flood vulnerability of assets and operations that are located in the basements of buildings in floodprone areas of the campus. For the high-priority/critical facilities identified by the HMC, engineers and planners will carry out site visits and perform physical evaluations of buildings and operations in order to determine vulnerabilities. This work is supplemented by reviews of building plans and engineering reports. The result of the vulnerability assessment process is a brief report for each facility describing potential damages when it is exposed to natural hazards such as flooding and wind.

After the hazard identification and profiling steps are finished, the planning team will combine the data from those efforts into a risk assessment. A risk assessment is a probability-based calculation of how much damage is likely to occur in the future from the impacts of hazards. It considers physical damages, losses of operational function, injuries and deaths. The risk assessment allows different hazard impacts to be compared so that the University can fully

understand which risks are most significant, and can prioritize actions to reduce them.

The overarching purpose of a mitigation plan is to use a risk-based approach to identify and prioritize mitigation strategies and projects. The result of this work is a list of objectives, strategies and actions that are prioritized by the HMC, and form the basis of the plan. This section of the plan will describe all the strategies and actions, discuss the risks they mitigate, address their cost effectiveness, and identify potential funding sources and implementation timelines.

The Plan is slated for completion in the summer of 2007. If you are interested in getting more information about the UM Hazard Mitigation Plan, contact Julie Kromkowski ([jkromkowski@fm.umd.edu](mailto:jkromkowski@fm.umd.edu)).

There will be two public presentations to review draft and final versions of the plan. These are tentatively scheduled for May 10 and June 26, 2007, at a place to be determined. These presentations will be advertised in the local newspapers and are open to all interested parties.

This article was shortened to accommodate our newsletter, for the full, original text please contact Steve Pardue at [spardue@visseringpardue.com](mailto:spardue@visseringpardue.com).

*Thank you to Steve Pardue of Vissering Pardue & Associates for providing this article. The Maryland-based hazard mitigation planning and risk assessment firm is assisting UM in developing its mitigation plan.*

## **Kent County and Anchoring Fuel Tanks**

The Kent County Planning, Housing, and Zoning Department processes anywhere from 600 to 700 building permits per year. The County is comprised of over 300 miles of shoreline; therefore, many of those building permits are processed for properties located in the floodplain. In 2003 and 2004, the years following Hurricane Isabel, the Planning Department processed a disproportionate number of permits within the floodplain, most of those recovery permits in the Town of Rock Hall. When a property owner stepped into the office during that timeframe, not only was there a telltale stack of paperwork marking an Isabel recovery project, but also there was a strong odor of fuel that followed that paperwork into our files. It became immediately

apparent that ensuring all fuel tanks were anchored in the County's floodplains was a top priority. The County applied for and received a Maryland Emergency Management Agency Mitigation Assistance Grant to address tank anchoring education in the County.

Unanchored fuel tanks comprised one of the significant problems in the Rock Hall area during the flood event and during the clean up efforts. Not only did fuel tanks that were set adrift damage property, but also, dislodged fuel tanks created enormous cleanup problems. Isabel was the first flood event that has caused damage via unanchored fuel tanks in so far as any of the residents could recall. Historic hurricane events such as Camille in 1969, Agnes in 1972, David in 1979, Gloria in 1985, or Floyd in 1999 did not have the surge event that accompanied Isabel. None of the properties had experienced flooding to the degree that took place during the tidal surge that followed Isabel.

The County developed an educational program specific to floodplain regulations and tanks. These programs were presented to area realtors and are available to them for use with clients who are looking at the vast acreage of property located in the floodplain, a desirable area of real estate in our community. The educational programs not only outline regulations in the Kent County Floodplain Ordinance, but also outline proper elevation and anchoring requirements, so property owners are knowledgeable as to the policies that their contractors and fuel providers are following on their properties.

As identified in the Kent County Hazard Mitigation Plan, the County is committed to creating awareness among county residents of the potential hazards associated with floodplain areas and the ways they can protect themselves and their properties from flood events. The County has identified these educational programs as a means of providing the framework for floodplain regulation seminars to area contractors, real estate agents, and insurance providers on an annual basis.

*Thank you to Amy G. Moredock of Kent County Department of Planning, Housing, and Zoning for providing this article.*

## Engineering a New Flood Study

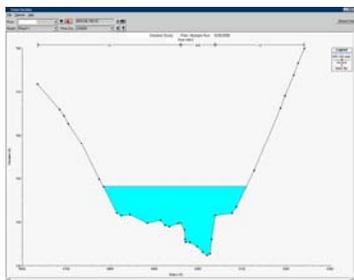
Floodplains are used by communities, developers, insurance companies and homeowners to determine flood risk areas. Flood areas undergo constant change, primarily due to natural topography changes and human development. This creates the need for communities to update their Floodplain Insurance Rate Maps (FIRMs).

A new riverine floodplain is delineated through the combination of several separate engineering processes. Each step is essential to the simulation of floodwaters for predictable storm events. The key ingredients to a properly engineered floodplain are terrain creation, hydrologic analysis, and hydraulic analysis.

*Terrain Creation* – Topographic information must be obtained before any new flood study can begin. This can be accomplished in a variety of ways, including LIDAR (Light Detection and Ranging) or USGS Digital Raster Graphic contours.

*Hydrologic Analysis* – The product of a hydrology analysis for a riverine flood study is a maximum flow-rate at any point along a study stream. This is mainly a product of rainfall intensity, contributing drainage area (determined by the terrain), impervious areas such as parking lots and buildings, and flow data from stream gages.

*Hydraulic Analysis* – After terrain creation, hydrologic analysis, and, in many cases, field surveys of road crossings, dams, and the stream channel, the engineer is ready to determine flood elevations along the stream through hydraulic analysis. In the most common methods of floodplain simulation for NFIP studies, stream cross-sections are used to represent the terrain along the entire stream. Cross-sections are also defined by channel width, channel slope, a coefficient of roughness and, where applicable, structure data.



*A cross section view for the hydraulic analysis of the stream.*

Flood elevations are computed by simulating the stream flows through the stream cross-sections. The flood boundaries are drawn using known flood elevations at the cross-sections and the contours between them. These boundaries are placed on new FIRMs, and then can be used to determine flood risk for properties and communities.

*Thank you to Mike Seering, Water Resources Engineer for URS for providing this article.*

## Ideas for Articles

We welcome your input and ideas. If you would like to contribute to the newsletter, please contact Necolle Maccherone at [necolle.maccherone@mapmodteam.com](mailto:necolle.maccherone@mapmodteam.com)

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