

Abstracts for Concurrent Sessions

Thursday, November 20th: 1:30 pm

A-1: National Flood Insurance Program Information

Ins and Outs of Countywide Floodplain Mapping in Urban Counties: Vincent R. Parisi,
DHS/FEMA Region V

This presentation will focus on some of complexities of countywide Flood Insurance Rate Maps process from a FEMA perspective. Topics will include:

- Benefits of a Countywide Ordinance in the map adoption process
- Summary of Map Actions (SOMA) - what Letters of Map Change (LOMCs) are incorporated and what local community officials need to know to avoid problems after map effective date
- How cross county communities are mapped when there are countywide maps for the entire community and when only a portion of the community has countywide mapping
- Retrofitting policy
- How to make final meeting more effective
- How to utilize your new DFIRM

Determining Base Flood Elevations from Studied Flood Zones: Christopher L. Budd,
CFM, PBS&J

There are certain guidelines established for determining a 1% annual chance (100-year) flood elevation or Base Flood Elevation (BFE) in a studied Zone, as shown on the effective Flood Insurance Rate Map (FIRM). This would include BFEs in Zones A(1-99), AE, AH, and AO. There seems to be a lot of different ways of establishing a BFE from detailed zones and just as many interpretations. Even the smallest of variations can mean the difference between a compliant structure and a non-compliant structure. Under the regulations governing the National Flood Insurance Program (NFIP), a non-compliant structure could be in potential violation of Section 44 of the CFR Part 60.3(c)(2), which states the low floor of a structure must be at or above the BFE.

This presentation outlines the process for establishing BFEs on detailed flooding sources. This will enable communities to better regulate their floodplains with more accuracy. The four main types of flooding that affects the Minnesota area will be discussed: Riverine, Lake (Stillwater), Sheet Flow, and Ponding. Several examples for determining BFEs on each type of flooding will be shown.

Efficient MT-1 Submittals: Christopher L. Budd, CFM and Andrew R. Ratliff, CFM, PBS&J

The Federal Emergency Management Agency (FEMA) has established a process to amend or revise the effective Flood Insurance Rate Maps (FIRMs). This process, known as the MT-1 Letter of Map Correction (LOMC) process, includes Letter of Map Amendments (LOMAs), Conditional Letter of Map Amendments (CLOMAs), Letter of Map Revision based on Fill (LOMR-Fs), and Conditional Letter of Map Revision based on Fill (CLOMR-Fs). For each of the LOMCs mentioned above, there are several forms and supporting data requirements necessary in order for FEMA to make a determination. Submitting these forms and supporting data accurately and completely at the time of the initial submittal will ensure that FEMA, upon review of the data, can make their determination in a timelier manner. Incomplete submittals can take a considerably longer amount of time to complete due to correspondence between FEMA and the Requestor.

This presentation will outline the basic procedures for applying for LOMAs, CLOMAs, LOMR-Fs, and CLOMR-Fs, as well as the different forms and supporting data required for each. How to accurately complete the necessary forms and data requirements for each submittal will be discussed and examples will be shown.

A-2: Flood Hazard Areas - Identification and Mapping

Integrating Geographic Information Systems with Floodplain Modeling and Delineation: Timothy Anderson and Sarah Stratton, Barr Engineering Company

The utilization of GIS as a pre- and post-processor for modeling and mapping is becoming the norm for floodplain studies. GIS is typically available to most professionals performing floodplain analysis. However, taking full advantage of GIS to develop higher quality floodplain mapping requires many tools that may not be available "out of the box" with GIS.

Several programs (e.g. HEC-GeoRAS) are available in the public domain that help floodplain modelers and mappers work between GIS and models. In many cases, these tools have been found to increase efficiency as pre- and post-processors, but often require very specific and detailed input data sets (e.g. LIDAR data). However, there are many instances where data availability, monetary constraints, and the quality of data available may hinder the usefulness of these programs. Also, often these programs can be cumbersome and therefore discouraging to use.

Methods and applications will be described to simplify the effort in developing GIS floodplain modeling data from typical data sources (e.g. survey data) to use in HEC-RAS and XP-SWMM. Methods to present modeling results will also be described.

Highway 63 Floodplain Challenges, Rochester, MN: Art Kalmes and Tom Johnson, Polaris Group, Inc.; Jai Kalsey, Mn/DOT Project Manager

During the next several years the Minnesota Department of Transportation (Mn/DOT) will be reconstructing a major portion of U.S. Highway 63 in southern Rochester, Minnesota. The project involves reconstruction of approximately two miles highway, construction of approximately four miles of arterial street, and construction of two new interchanges. A Conditional Letter of Map Revision (CLOMR) from the Federal Emergency Management Agency (FEMA) was required as part of the permitting process for the project. This presentation will present the challenges of the floodplain analysis and permitting, including:

- correcting existing mapping and modeling problems
- performing hydraulic analyses and design of 10 crossings
- accounting for dam safety issues from a upstream flood control reservoir
- addressing the concerns of a large number of stakeholders and landowners
- design of a levee, interior drainage, and channelization
- incorporating the affects of two regional storm water ponds

A Multi-Faceted Approach to Urban Flood Mitigation: Suresh Hettiarachchi and Anthony Luft, HDR; Jane Onorati, City of Minneapolis

The summer of 1997 saw multiple major storm events in the City of Minneapolis (City) which caused extensive flooding and damage to homes and property. Following which the City produced a Flood Mitigation Report that identified areas within the City that needed flood reduction efforts. Flood Area 27 (FA27) refers to the neighborhood north east of Lake Hiawatha which has three locations that are local low areas that experienced flooding.

The preferred solution was to install additional sewers to carry storm water to outlet to Minnehaha Creek (Creek). Though initial thought was that the peak from the outlet would not coincide with the peak flow in the Creek, calibration model runs indicated otherwise, which forced the team to re-analyze the problem and develop alternate solutions.

The design approach changed to a multi-faceted localized effort rather than providing relief to all three zones with one project. These efforts include; 1) concrete storage chambers under the streets to hold local runoff 2) sewer and inlet upgrades 3) crowning of streets to prevent run-by 4) raising sidewalks 5) and flood proofing of vulnerable homes. The underground storage chambers are designed to hold only the local runoff from the areas surrounding the low spot to provide relief from flooding until the existing sewers have sufficient capacity to drain the area. This project is scheduled for phased construction starting in the spring/summer of 2003.

A-3: Flood Hazard Mitigation Efforts

Granite Falls, MN Flood Mitigation Efforts: Nancy Johnson Dent and Bill Forsmark, Barr Engineering Company

The Minnesota River represents a valuable resource to the City of Granite Falls, as represented by the parks and residences located along the river banks, and the aesthetic, recreational, and economic benefits derived by the city, its residents, the surrounding communities, and visitors. However, since the city was first settled, the river has also taken its toll on residents during spring floods, with associated economic and social impacts to the community. Since 1997, there have been two historic flood events, and between these floods, a tornado. The flood of 1997 surpassed previous high flood elevations by almost 10 feet. Two separate studies were conducted to evaluate the options for flood mitigation.

The first study focused on the downtown area adjacent to the river, evaluating the economic viability of alternatives for mitigating flood damage in this area. The list of alternatives developed for flood mitigation included floodwalls, levees, flood-proofing structures, raising the alley, and utility protection. The evaluation included alternatives for constructibility, magnitude of cost, and space requirements. Four design options were evaluated as protection for the entire area, each providing a different level of protection for the three reaches. The recommended design was a cost effective option that combined conventional protection of underground utilities, installation of modified concrete Jersey barriers, and use of vinyl sheet pile to provide an interim-level of protection from repeated spring flooding.

The second study was developed under the Federal Emergency Management Agency (FEMA) Grant Program, with funds administered by the Minnesota Department of Natural Resources. The overall objective of the Hazard Mitigation Study was to identify and evaluate hazards for the Granite Falls area; prioritize public health, safety, and property damage risks; and develop a plan for implementation of mitigation measures for these hazards. Because of the tremendous impacts of flooding on the Granite Falls community, and the relative frequency of flooding events, the report focused primarily on flood hazards, and presents mitigation options and preliminary costs for implementing these options. This study is being used as a planning tool for implementation programs and to develop detailed evaluations of mitigation options.

Lower Level Drainage Considerations for a St. Paul Waterfront Development:
Rick Voigt, Polaris Group Inc.

The Upper Landing Urban Village is under construction along the Mississippi River in St. Paul, Minnesota. The site is a rehabilitation of a formerly heavily polluted industrial area and scrap metal yard. The lowest occupied floor elevation is planned at nominally eight feet above the 100-yr flood elevation. An underground parking ramp is to be constructed below the flood elevation. The location and its proximity to the river required incorporation of a number of design features to keep flood waters and subsurface water from entering the lowest level. The design uses information learned from low lying structures impacted by the 1997 and 2001 floods. This presentation will

present the design components selected and the analysis behind the selection including:

- Flood elevation - frequency analysis
- Groundwater seepage analysis
- Underdrain sizing and design
- Equipment issues
- Floodplain permitting

Integrating GIS with hydrologic and Hydraulic Modeling of a Floodplain: Suresh Hettiarachchi and Richard Gleason, HDR Engineering, Inc.

The hydraulic modeling work was done to update and add detail to the current Flood Insurance Study model for Burns Valley Creek. This is an initial step towards creating an accurate hydraulic model that can be used for future planning to protect the watershed and develop a Nonpoint Discharge Elimination System (NPDES) Phase II program. The study area and the floodplain mapping were extended further upstream from previous studies and significant detail was added to the model based on ‘as built’ and survey information on structures impacting the water surface elevation. Additional cross-sections were added based on Global Positioning System (GPS) survey information and a Geographic Information System (GIS) surface model. Detail was added to the previous flow distribution by delineating smaller sub-watersheds.

The resulting 100-year floodplain was mapped by matching the water surface elevation to the available terrain data. Due to the quality and limitations of the available terrain information and mapping, the results were compromised, and an exact link was not created between the hydraulic model and the maps. It is recommended that contours at a 2-ft interval be developed using a more dense grid for this area in order to refine the hydraulic model and the floodplain mapping. This will enable the City of Winona to make full use of the hydraulic model and the following phases of this project.

The next step in the comprehensive plan will be to calibrate the hydraulic model using data from the gages installed on Burns Valley Creek. The present HEC-RAS 2.2 model can be directly migrated to the new HEC-RAS 3.0 model, which will allow routing hydrographs through the creek. Rain event and land use based runoff hydrographs can be developed by coupling the GIS based hydrologic model to the hydraulics model. With the added advantage of gage data, the hydraulic model can be calibrated to accurately model rainfall runoff events through the creek, which will be a valuable tool for floodplain and watershed management for the City of Winona.

A-4: Red River Flood Lessons

28 Years of Successful Floodproofing in the Red River Valley: S. Bruce Langness, Ulteig Engineers, Inc.

Since the flood of 1969, 440 homes have been built in the floodplain of the Red River of the North within the communities of Fargo, North Dakota and Moorhead, Minnesota and surrounding rural area. These homes are built with floodproof basements with the basement floor below the 100 year base flood elevation (BFE). The Federal Insurance Administration has granted 21 communities in North Dakota and Minnesota that participate in the National Flood Insurance Program (NFIP) an exception to NFIP floodplain regulations that prohibit the construction of residential basements in the 100 year floodplain. Fargo, North Dakota and Moorhead, Minnesota are two of these communities.

The record flood of 1997 as well as three spring floods and two summer floods since 1969 caused no damage to the basements built in accordance with the FEMA and local floodproofing standards.

A FEMA-sponsored Building Performance Assessment Team (BPAT) was formed after the flood of 1997 to study the performance of basements in houses located in the floodplain of exempt communities. Fargo, North Dakota and Moorhead, Minnesota were two of four communities included in the study. The team gathered data to determine the effect of construction techniques of houses in the floodplain. Pre-FIRM and post-FIRM houses were inspected. The study found that the performance of floodproof basements built in accordance with the FEMA and Fargo-Moorhead floodproofing standards was acceptable.

A GIS based Flood Predictive Model for Moorhead, MN and Fargo, ND: Kendis Scharenbroich, Pro-West & Associates, Inc.

After the flood of 1997 that devastated the cities of East Grand Forks, MN and Grand Forks, ND, and did severe damage to the upstream cities of Fargo, ND and Moorhead, MN, the City of Moorhead, MN and Fargo, ND Public Works Department decided to prepare for possible future occurrences by constructing a GIS-based flood predictive model. A spatial flood-effect model was constructed using LIDAR topographic data, a GIS parcel base map, and Red River flood profile data (at varying flood intensities). This information was combined into a GIS that would predict the flood impacts on adjacent properties and structures for differing river stages. In addition, this information was made available to the public via an interactive spatial model, which allowed city residents to visit a website to determine the possible effect on their property and structures due to the predicted crest of the Red River.

This presentation will discuss the data needed to develop a GIS flood model, steps to obtain the data you require, benefits seen by both Moorhead, MN and Fargo, ND since their flood modeling has been completed, and a demonstration of the interactive web-based flood model available to the public.

Roseau: The Road to Recovery from the June 2002 Flood: Brian K. LeMon and Bill Spychalla, Barr Engineering Company

In June 2002, the City of Roseau, Minnesota was devastated by a flood of record proportions. The flood had an approximate return frequency of once in 500 years and was caused by extremely heavy rainfall over a three day period. The time between the flood warning and the flood peaks was about 2 days. However in spite of a valiant effort to raise and reinforce their temporary levees, the levee system was breached and almost the entire community was flooded. Backup sandbagging at the High School and at the Polaris Industries manufacturing plant was successful in keeping these facilities operable, somewhat lessening the overall impact of the flood.

Although the recovery process from the flood has been painfully slow, progress is being made in many areas. Temporary housing was provided for many residents whose homes were not inhabitable after the flood. Many substantially damaged structures were bought out. Repairs were and are being made to the public infrastructure, including the sewer systems and the streets. Other flood damage reduction measures are being pursued for implementation.

This presentation will focus on the flood at Roseau and the many activities undertaken or that are underway to minimize future flood damages at Roseau.

Friday, November 21st: 8:00 am

B-1: Comprehensive Land-Use Planning

Watershed Management Based on Ultimate Land Use: Leonard J. Kremer and Nancy Johnson Dent, Barr Engineering Company

The Bassett Creek Watershed has been managed using No Adverse Impact strategies since it was first organized over 30 years ago. The Bassett Creek Watershed Management Commission, formed to manage water resources in the watershed, developed a management plan and drainage system designed to accommodate floodwater runoff with ultimate development of the basin. The plan published a “management envelope” for the creek, which included all of the area that might be flooded with ultimate watershed development and all areas along the creek that could be used for floodwater storage in the future. At some locations, the “management envelope” was several feet in elevation above the 100-year flood profile with existing conditions.

The Commission succeeded in having all nine member cities adopt floodplain ordinances that were based on the “management envelope.” The paper will present the strategies that were the basis for development of the management plan, the issues that were confronted and the tools that were used to implement the plan.

Runoff Volume Management: The Prior Lake Outlet Channel And Lake Volume Management Study: Paul Nelson and Edward Matthiesen, Wenck Associates; Shannon Lotthammer, Prior Lake-Spring Lake Watershed District

A combination of accelerated urban development and the fact that the 1990s has been the wettest decade for the area this century, have lead to higher water levels on Prior Lake and flooding in 1998 and 1999. This flooding in turn has lead to intense pressure by citizens and the local city to enlarge the outlet system on Prior Lake.

Prior Lake was historically land locked with on outlet. A seven-mile long outlet system was finished in 1983. This paper presents how the Board of Managers resisted the temptation to push the current problem downstream with a larger outlet and have decided instead to manage the water “within the District.” The selected approach involves numerous strategies that balance upstream acquisitions, rules for new development and outlet optimization. A key element enabling this approach was the development of a calibrated runoff model and analysis of multiple strategies and their cost.

The First Step to Flood Plain Mitigation: Mike Panzer, Wenck Associates, Inc.

Long-term flood plain mitigation plans for rivers and streams should be based, in part, on adequate physical and ecological assessments. This way, it is possible for decision-makers to choose the most effective policy and methods to manage flood plains. The Minnehaha Creek Watershed District has undertaken such an endeavor for the primary streams within it's jurisdiction. The settings range from highly urbanized, to residential, to forested, to agricultural. For this assessment project, GIS was used to compile field data collected using morphological, ecological, and stability methodologies into a database to provide the basis for long- term flood plain mitigation.

B-2: Flood Hazard Areas – Identification and Mapping with Remote Sensing Applications

Modeling the Sacramento and San Joaquin River systems: Kirk Contrucci, Ayres Associates

During the past two decades, the Central Valley of California has experienced several of the most devastating floods of the past century. Four recent major floods caused widespread and extensive damage in the Sacramento and San Joaquin Valleys. The Sacramento District of the U.S. Army Corps of Engineers is leading the Sacramento and San Joaquin River Basins Comprehensive Study. The Comprehensive Study is focused on the impact of major floods in the Sacramento and San Joaquin Valleys.

The creation of a comprehensive, detailed model of the entire system was a vital component of the Comprehensive Study. The mapping effort requires successful integration of a variety of mapping technologies, including Light Detection And Ranging (LiDAR) mapping, photogrammetric mapping, and hydrographic mapping using real-time Kinematic GPS and survey grade fathometers. This paper outlines the methodology, results, and applications of hydrologic and topographic mapping of the Sacramento and San Joaquin River systems.

Floodplain Mapping and Hydraulic Analysis using High Density LIDAR for the City of Fargo, North Dakota: C. Gregg Thielman, CFM, Houston Engineering, Inc., and Doug Jacoby, Merrick & Company

Recent floods along the Red River of the North and its tributaries have heightened the need for sound floodplain management for communities in the floodplain. A valuable floodplain management tool for these communities is accurate floodplain maps. The City of Fargo, North Dakota has contracted with Houston Engineering, Inc. to conduct a hydraulic analysis and floodplain mapping of the Red River of the North through Fargo. The project includes obtaining high density aerial mapping coverage for areas within Cass County, North Dakota and Clay County, Minnesota using LIDAR (Light Detection and Ranging). Houston Engineering Inc. contracted with Merrick & Company to obtain the LIDAR data. Cost share assistance for the project was provided through FEMA's Cooperative Technical Partner (CTP) Program.

The study also includes an update to the existing hydraulic model for the Red River through the Fargo-Moorhead area. The model was updated by adding surveyed cross sections and updating the overbank portions of the existing cross sections using the aerial mapping data (LIDAR). The hydraulic model was calibrated and hydraulic profiles were run for the 10-, 50-, 100-, and 500-year floods using the Corps of Engineers HEC-RAS water surface profile program. HEC-GeoRAS was utilized for the hydraulic model development and for floodplain mapping. The existing floodway will also be checked.

The LIDAR data along with the City of Fargo's GIS data will be used to map the 100-year and 500-year floodplain for the Red River through Fargo. The high density point coverage provided by the LIDAR will allow individual homes to be accurately mapped. This will be particularly beneficial for areas along the fringe of the floodplain. The hydraulic model and floodplain maps will be submitted to FEMA for technical review and publication as updated Flood Insurance Rate Maps (FIRMS) for the City of Fargo.

This presentation will explain the methods and benefits of using a high density DTM produced by LIDAR for conducting a flood insurance study and floodplain mapping of an urban area in the Red River Valley.

Watershed Based Stormwater Modeling Using GIS: Richard Gleason, David Johnson, Suresh Hettiarachchi, HDR Engineering, Inc.; Matt Moore, South Washington Watershed District

Recent development pressures in the metro area have made it necessary for us to re-examine our current infrastructure and develop management plans to deal with possible inadequacies and future needs. During this process, numerous datasets from different sources and multiple model runs are utilized to achieve the above. The ability to use GIS has made it easier to organize the data/results and streamline the techniques that were used in the past to create modeling tools. The South Washington Watershed District is currently in the process of updating their current planning tools using GIS.

The initial phase of the project was to gather data such as pipe inverts, lengths, conditions through GPS/Total Station surveys and record plan reconnaissance. Next, physical characteristics of the watershed such as drainage areas, storage, and land-use were determined using recent orthophotography and 2 foot contours. Then, a base model was built using data imported directly from GIS to XP-SWMM. The base model will be used to analyze the current storm runoff network and to determine the effects of future planning proposals within the watershed district. Modeling results can be exported back to GIS to graphically illustrate possible hazards.

B-3: Flood Hazard Mitigation Efforts

Minnesota's Enhanced Flood Forecast/Warning System: Judy Boudreau and Greg Kruse, Minnesota DNR Waters

Thirty-eight stream gages were installed statewide in 1998 as a result of a federal/state grant that was obtained by the Minnesota Division of Emergency Management (DEM). These stage only gages were installed in response to extreme flooding events in the 1990's, which may have been less damaging with more data available in the affected watersheds.

This project demonstrates cooperation between the agencies – DEM, the Minnesota Department of Natural Resources (DNR), the National Weather Service (NWS), and the USGS – and the affected flood-prone communities.

DNR is making regular field visits, measuring flow, assisting NWS with maintaining equipment, and eventually converting the stage data to discharge at priority sites. Real-time flows are available on the gage website for at least 9 stations.

The gages have become valuable tools in flood prediction, water quality and quantity projects, and hydrologic and hydraulic modeling efforts.

Floodplain Risk Analysis, Northfield, MN: Art Kalmes, Polaris Group, Inc.; Randy Peterson and Jon Lennander, City of Northfield

Structures located in flood prone areas are often built above the 1 percent chance flood elevation based on a predetermined freeboard protection level. Although this typically provides an acceptable level of protection for individual property owners, the design of the flood control system may not be optimized if many structures are placed at the minimum freeboard protection level. Variations in the rainfall, antecedent moisture conditions, or hydraulic performance from the assumptions used to determine flood levels can also affect the risk to adjacent property owners.

Risk based procedures which consider event probabilities, cost of damages, and capital costs can be used to better optimize the design of flood control systems compared to conventional measures. Risk based procedures can also consider the uncertainty of hydrologic and hydraulic modeling assumptions.

The City of Northfield, MN recently applied risk based methods in the design of flood

control measures along Spring Creek and in adjacent regional flood control ponds. The presentation will discuss the practical application of risk based procedure in the design of flood control systems for this developing area.

Removing a City from a Floodplain: Nate Dalager and Suresh Hettiarachchi, HDR Engineering, Inc.

The City of Warren experienced three floods in 1996 and 1997. The entire City is in the floodplain. Thanks to a \$12 million NRCS PL-566 FDR project that is now underway, the City will be removed from the floodplain both literally and administratively, in about three years.

Follow the two parallel processes that are making this possible.

1. Construction of the project
2. FEMA Letter of Map Revision process

The presentation will cover a historical summary, points of interest, problems and successes with the project, and technical matters.

B-4: Flood Frequency Analysis

Sunnybrook Lake Landlocked Basin Analysis: Scott Sobiech and Nancy Johnson Dent, Barr Engineering Company

Determining flood levels of landlocked basins has resulted either in highly simplistic approaches or expensive custom simulations. Readily available software (XP-SWMM with MODFLOW) was used with 50 years of climatologic data to develop flood levels for Sunnybrook Lake in Washington County. The Sunnybrook Lake neighborhood has experienced flooding several times since the lakeshore homes were constructed in the late 1960s and early 1970s.

The simulations that were included existing conditions and several proposed options. The analysis included evaluation of the feasibility of an emergency overflow from Sunnybrook Lake to Brown's Creek and incorporation of expansion lands in the Indian Hills Golf Course to be used for relieving flooding.

Updated Red River of the North Flood Profiles: Aaron W. Buesing, St. Paul District US Army Corps of Engineers

Subsequent to the record 1997 flood the Corps of Engineers and FEMA funded the Corps' St. Paul District to recompute the flood frequency curves and profiles for the entire United States portion of the Red River of the North. Doing the whole river at once allowed the Corps to use a regional approach for determining the frequency curves and profiles. The result is a consistent set of values that will form a strong basis for future RRN studies and development. An outline of the study and the final results will be presented. CD's with the full report will be available for distribution at the conference.

Mississippi River Flood Profiles: Stuart V Dobberpuhl, St. Paul District US Army Corps of Engineers

The Corps of Engineers recently completed an update of the flood frequency curves and profiles for the Mississippi River from Hastings through St. Louis, Missouri. Doing the whole river at once allowed the Corps to use a regional approach for determining the frequency curves and profiles. The result is a consistent set of values that will form a strong basis for future Mississippi studies and development. The Corps has also been funded by FEMA to develop a “first-shot” floodway for this entire reach. An outline of the completed profile study and the final results will be presented, as well as a brief description of the currently underway floodway study. CD’s with the final profiles should be available for distribution at the conference.