



FEMA

# TMAC

## Technical Mapping Advisory Council Meeting December 4-5, 2014

### TMAC Members

Doug Bellomo  
Juliana Blackwell  
Nancy Blyler  
Richard Butgereit  
Mark DeMulder  
John Dorman  
Leslie Durham  
Scott Edelman  
Steve Ferryman

Gale Fraser  
Carrie Grassi  
Chris Jones  
Howard Kunreuther  
Wendy Lathrop  
David Mallory  
Robert Mason  
Sally McConkey  
Christine Shirley  
Cheryl Small

### Speakers and Briefers

Ken Ashe, State of North Carolina  
Jerad Bales, USGS  
Chad Berginnis, Association of State Flood Plain Managers  
Eric Berman, FEMA  
Erin Cobb, FEMA  
Richard Fogleman, AECOM  
David Key, ESP Associates

Paul Kovacs, Institute for Catastrophic Loss Reduction  
Vicki Lukas, USGS  
Tucker Mahoney, FEMA  
Doug Marcy, NOAA  
Amar Nayegandhi, MAPPS/Dewberry  
Andy Read, FEMA  
Ty Wamsley, U.S. Army Corps of Engineers

### Government Attendees

Kathleen Boyer, FEMA, TMAC ADFO  
Darryl Clark, FEMA  
Mark Crowell, FEMA, TMAC DFO  
Victoria Fresenko, DHS  
Michael Godesky, FEMA, TMAC ADFO  
Doug Marcy, NOAA  
Doug May, NOAA  
Sean McNabb, FEMA Region VIII

Andy Neal, FEMA  
Seamus O'Boyle, FEMA  
Lynda Pilgrim, FEMA  
Richard Smith, FEMA  
Jonathan Westcott, FEMA  
John Vocino, Senate HSGAC  
Alexandra Woodruff, FEMA

### Registered Public Attendees

Ken Ashe, State of North Carolina  
Graham Bouchoux, Booz Allen Hamilton  
John Byrd, MAPPS  
David Conrad, no affiliation  
Goston Cohillo, CDM Smith  
David Grant Hill, Booz Allen Hamilton  
Merrie Inderfurth, ASFPM  
Alex Lord, Booz Allen Hamilton

Bel Marques, URS/AECom  
Tim McCormick, Dewberry  
Daven Patel, Atkins/Starr  
Russell Riggs, National Association of Realtors  
Mark Romano, Harris Corp.  
Velma Smith, Pew  
Jerry Sparks, Dewberry/ROMPP  
Allison Westland, Michael Baker International

### Support Staff

Angela Bidnick, Booz Allen Hamilton  
Kirsten Folkedal, Booz Allen Hamilton  
Michelle McQueeney, J-M Global

Allison Skeer, Booz Allen Hamilton  
Angela Stonebraker, Booz Allen Hamilton  
Adam Warfield, Booz Allen Hamilton  
Melissa Zientek, Booz Allen Hamilton

## **Purpose**

The purpose of the meeting was to allow the Technical Mapping Advisory Council (TMAC) members to discuss its legislative requirements and hear presentations related to the Federal Emergency Management Agency's (FEMA) national flood program, including those on: (1) overall flood management process and components; (2) data acquisitions, maintenance and dissemination; (3) future conditions risk to insurance rating; (4) database, mapping, and digital display; (5) risk assessment and mapping; (6) key decision points; (7) engineering/study production (riverine; levee; coastal); (8) current and future possibilities; and (9) examples of next generation flood risk management.

## **December 4, 2014**

### **Call to Order/Roll Call**

Mr. Mark Crowell, Federal Insurance and Mitigation Administration and TMAC Designated Federal Officer (DFO), opened the meeting and welcomed members. Mr. Crowell explained that as the TMAC DFO, he serves as a liaison between the TMAC and FEMA and is responsible for ensuring all TMAC operations comply with the provisions set forth in the *Federal Advisory Committee Act* (FACA). He introduced the alternate DFOs (ADFO), Mr. Mike Godesky and Ms. Kathleen Boyer, as well as additional support staff.

Mr. Crowell discussed the meeting operations and said that there is a public docket for the meeting. He noted that copies of meeting materials and the public comments are or will be available on [regulations.gov](http://regulations.gov) under the docket number listed in the Federal Register notice. Discussing the public comment period, Mr. Crowell said if public commenters are interested in a comment, they should register at the registration and hospitality desk. He also noted that per FACA, staff will prepare a meeting summary that includes a description of the matters discussed and the conclusions reached by the TMAC. The summary will be available to the public through [regulations.gov](http://regulations.gov) and the TMAC website.

Mr. Crowell took roll call of TMAC members and then introduced Mr. John Dorman, TMAC chair.

### **Vision Statement Discussion**

Mr. Dorman thanked all TMAC members for providing input into the TMAC vision statement. He presented an aggregated vision statement slide that included nine characteristics of or activities that the mapping program would support within the next five years. Specifically, the program would:

- Construct and communicate comprehensive flood hazard risk at multiple resolutions;
- Construct, display, and disseminate database-derived flood hazard risk data, models and assessments;
- Embrace and incorporate current and emerging technologies in the acquisition, storage, generation, display, and dissemination of data, models, and services;
- Advocate and incorporate accurate data associated with development and environmental changes;
- Aggressively embrace digital media/devices to communicate flood hazard risk data, models and maps;
- Seamlessly incorporate flood hazard risk into the hazard risk mitigation lifecycle;
- Seamlessly support flood hazard determination and flood risk insurance rating;
- Receive funding that will support the necessary maintenance of all Flood Insurance Rate Maps (FIRMs) nationwide; and
- Effectively utilize and partner with local, State, and Federal partners.

Members should review and provide feedback on the vision statements, which Mr. Dorman hopes can be adopted during the TMAC's February 2015 meeting. Mr. Doug Bellomo, TMAC member, asked Mr. Dorman how Section 215 of the *Biggert-Waters Reform Act of 2012* (BW-12) relates to or complements the draft vision statement. Mr. Dorman said the vision statement is intended to correlate to the language in Section 215, but would like to keep the vision statement points sufficiently broad to encompass the legislation. Mr. Howard Kunreuther, TMAC member, also noted that the TMAC could use the vision statement to measure progress and periodically reassess its efforts to ensure it still aligns to the vision statements. Mr. Dorman cautioned that the vision statement will likely be something that the TMAC will never fully achieve. Ms. Carrie Grassi, TMAC member, also added that in the fourth bullet, "climate change" should replace "environmental change."

### **Subcommittee Work Charge Assignments**

Mr. Dorman discussed the subcommittees that he, Ms. Sally McConkey, TMAC member, and Mr. Scott Edelman, TMAC member, sought to establish prior to the meeting that aligned with the TMAC's legislative requirements:

- **Future Conditions:** Consult with scientists and technical experts, other Federal agencies, States, and local communities to develop recommendation on how to (1) ensure FIRMs incorporate the best available climate science to assess flood risks; (2) ensure that FEMA uses the best available methodology to consider the impacts of (a) the rise in sea level and (b) future development on flood risk. (Led by Mr. Edelman)
- **Flood Hazard and Risk Generation:** Recommend to the Administrator: how to improve in a cost-effective manner the accuracy, general quality, ease of use, and distribution and dissemination of FIRMs and risk data; how to improve in a cost-effective manner the performance metrics and milestones required to effectively and efficiently map flood risk areas in the United States; mapping standards and guidelines for FIRMs; mapping standards and guidelines for data accuracy, data quality, and data eligibility. (Led by Ms. McConkey)
- **Operations, Coordination, and Leveraging:** (1) Recommend to the Administrator how to maintain, on an ongoing basis, FIRMs and flood risk identification; (2) recommend to the Administrator and other federal agencies a funding strategy to leverage and coordinate budgets and expenditures across federal agencies; procedures for delegating mapping activities to State and local mapping partners; and (3) recommend to the Administrator and other Federal agencies participating on the Council methods for improving interagency and intergovernmental coordination on flood mapping and flood risk determination. (Led by Ms. Leslie Durham, TMAC member)

He reminded members that they indicated interest in serving on specific subcommittees during the September 30-October 1, 2014, TMAC meeting and reviewed subcommittee assignments. Members can participate on more than one subcommittee.

Mr. Dorman proposed combining the TMAC's Flood Hazard and Risk Generation and Operations, Coordination, and Leveraging Subcommittees' reports. Several members agreed that this would help the TMAC complete the legislative requirements within the next year and also help reduce each TMAC member's individual level of effort. Mr. Bellomo questioned the rationale of consolidating the reports and that the legislative requirements may be open to interpretation, as the statute only states the TMAC needs to conduct "the review of a program." He continued that this could be the current program or a future program, which the Administrator must then certify. Additionally, there may be the option to defer the third report for a future date. Several members agreed with Mr. Bellomo, noting that the TMAC may lose some of the nuances of the three reports, as well as opportunities to underscore specific recommendations, if they opt to combine them. Mr. Bellomo reiterated that BW-12 Section 216 clearly states that FEMA is to establish an ongoing program, which the TMAC could also help establish. Members agreed to continue to discuss this issue in future meetings.

Regarding subcommittee operations, Mr. Dorman asked members to please consider different subject matter experts who should be requested to participate on the subcommittees.

## **Process towards Recommendations and Report**

Mr. Edelman provided an overview of a proposed process that the TMAC can use to develop its report. He said the process has been used successfully in the past to compile large-scale working group reports and tries to eliminate any last-minute directional changes. He said the process challenges authors to: (1) decide what they want in advance; (2) maintain clarity throughout the process; (3) question their assumptions; (4) project forward; (5) determine why an objective is desired; and (6) periodically review progress. Mr. Edelman also said that these considerations will help the TMAC be strategic so that 80 percent of the recommendations will be implemented.

The process has five steps: (1) holding the kickoff meeting (Mr. Edelman said the December meeting should be considered the TMAC's kickoff); (2) develop a strategic plan of what the TMAC wishes to accomplish; (3) conduct information gathering, leveraging outside expertise if needed; (4) develop a report that consists of annotated mark-ups, beginning as a detailed table of contents with page allocations and potential graphics; and (5) develop report drafts and the final submission.

Regarding the schedule, Mr. Edelman said that the TMAC should begin to set its 2015 work plan or goals during the course of the meeting. He said that information gathering will occur through the end of March 2015, and during this time, it would be critical for all members to have access to materials via a SharePoint site. The council will develop a detailed table of contents at the end of April 2015 and will begin writing in June 2015. The subcommittees will begin deliberating on the text in July and September 2015.

Members agreed that structure would be needed to facilitate the report's development; however, it would be important to maintain a degree of flexibility to account for new developments or information. Mr. Edelman agreed, and said that any new topics would likely be addressed in future reports instead of trying to accommodate the topic in the 2015 report. Mr. Kunreuther also suggested that the reports' principal objectives relate to the TMAC vision statement. Ms. McConkey said that the TMAC should first begin to identify its overarching objectives and then ensure they are reflected in the vision statement. From there, the TMAC can identify both short- and long-term goals.

Mr. David Mallory, TMAC member, asked how the TMAC schedule would intersect with FEMA's planning and budget cycle. Mr. Bellomo replied that the Fiscal Year (FY) 2016 budget is already being finalized so the TMAC's recommendations would likely be incorporated in FY 2017, if the Administrator chooses to do so. He said the TMAC's ability to meet its October 1, 2015, report deadline will be critical.

Ms. Durham discussed the aggregate recommendations spreadsheet that was distributed to members prior to the meeting, noting that the sheet contained recommendations developed by other groups that related to the TMAC's charges. She asked members to please review and rank the recommendations in terms of how important it was for the TMAC to readdress those items. Additionally, if there are recommendations from reports that are not included, members should add them to the spreadsheets. All members should submit the spreadsheets to Mr. Dorman on the evening of December 4, 2014. Mr. Chris Jones, TMAC member, asked if FEMA or another agency is actively tracking the status of the recommendations in the spreadsheet. Mr. Bellomo replied that while FEMA does leverage the recommendations when developing or modifying its programs, FEMA does not have a single office that tracks progress.

## **Public Comment Period**

Mr. Crowell announced that, per FACA, members of the public were invited to provide written comments on the issues to be considered by the TMAC. He noted that those comments were to be submitted and received by November 25, 2014, as noted in the Federal Register. In addition, those interested in speaking at the meeting should have registered as a speaker by November 25, 2014. He requested that speakers limit their comments to no more than three minutes and said that the public comment period will not exceed 30 minutes.

Mr. Crowell said that the TMAC received no request for speakers in advance of the meeting. He reminded participants that there will be time set aside on December 5, 2014, for additional public comments.

### **Overall Flood Management Process and Components**

Mr. Andrew Read, Engineering Management Branch, Risk Analysis Division, FEMA, provided an overview of FEMA's map production process. He said that the process has seven phases and can take from three to five years to complete. Under Risk MAP, he explained that FEMA is prioritizing community engagement and support of the mapping products, as well as technical credibility of the maps.

Mr. Read discussed each phase in detail, outlined below:

- Phase 1, Planning and Budgeting, is used for preliminary information and scoping of the region and its priorities, metrics, and needs. In this phase, FEMA identifies and coordinates with its mapping partners. (3 month process)
- In Phase 2, Discovery, FEMA headquarters and regional staff hold a discovery meeting to work with local stakeholders and identify the projects that will be moving forward. (5-9 month process)
- In Phase 3, Data Development and Sharing, FEMA assembles the data that it has gathered and developed, and shares the data among all participants. (9-15 month process)
- In Phase 4, Risk Awareness and Mitigation Outreach, regional mitigation planners help communities understand mitigation options and increase resilience (e.g., conduct a Resiliency Meeting). (1-3 month process)
- In Phase 5, Proposed National Flood Insurance Program (NFIP) Map Changes and Impacts, preliminary FIRMs and flood insurance study (FIS) reporting occurs. FEMA also conducts Congressional outreach, and notifies property owners of changing flood risk, in accordance with Federal legislation. (1-3 month process)
- In Phase 6, Preliminary Map Release and Mitigation Planning, FEMA distributes the preliminary FIRMs to the community, State, and region. This phase begins a 30-day comment period for the public to review and comment on the preliminary FIRMs. (1-3 month process)
- In Phase 7, Due Process and the Path Forward, the Consultation Coordination Officer (CCO) holds a meeting to review the preliminary FIRMs and collect any public comments. This phase also initiates a 90 day appeal period, which is published in the Federal Register Notice and local newspapers. After FEMA has addressed all comments or appeals and issues a Letter of Final Determination, communities have six months to adopt the preliminary FIRM and the requirements set forth by the NFIP for the maps to become effective. FEMA also publishes a Federal Register notice when the FIRM becomes effective. (9-15 month process)

Mr. Read shared some of the tools that FEMA uses throughout the process, including the Coordinated Needs Management Strategy (CNMS); Project, Planning, and Purchasing Platform; the Mapping Information Platform; and Map Service Center, among others. FEMA also uses State and local community input throughout the process as well. Mr. Read closed by underscoring the importance of community engagement, technical credibility, and promoting awareness and action during the mapping process to ensure success. He again acknowledged that the mapping process typically takes from three to five years, but that it can take longer in coastal areas. He then opened the meeting to questions.

Mr. Ferryman asked if FEMA tracks the appeals on maps that were created with and without lidar, wondering if the lidar maps were less contested due to their increased accuracy. Mr. Read and Mr. Bellomo commented that FEMA does not track appeals in relation to lidar, but noted that the vast majority of appeals are for areas where the floodplains are growing, regardless of whether or not lidar was used. Mr. Bellomo stated that the community and personal impact is generally more likely to cause an individual to protest or appeal a map change.

Mr. Richard Butgereit, TMAC member, asked if each county's status in the seven-step process is publicly available on the FEMA or other website. Mr. Read responded that the Risk MAP's external site does not list project-specific information.

Ms. Grassi asked if FEMA examined the frequency, location, and reason that map development process timelines are not met so that they can be used to improve the program in the future. Mr. Read responded that FEMA is tracking that information, collecting it from FEMA's Mapping Information Platform. FEMA regional staff also examine that information and the communities from which they received the feedback.

Another member inquired about the use of the Scientific Resolution Panel (SRP). Mr. Read responded that the SRP is coordinated by the National Institute for Building Sciences. The SRP provides a recommendation to the FEMA Administrator. He noted that very few scenarios have been addressed through SRP action.

### **Data Acquisition, Maintenance, and Dissemination**

Ms. Vicki Lukas, Topographic Data Services Chief, U.S. Geological Survey (USGS) provided a briefing on the USGS National Geospatial Program. The program's purpose is to provide the nation with topographic information and defining data layers of topographic mapping. She described the USGS' areas of national leadership (OMB Circular A-16 Lead for Terrestrial Elevation, A-16 co-lead for Inland Waters, and national coverage of topographic maps) and its role facilitating and supporting the Federal Geographic Data Committee (FGDC), an interagency committee responsible for coordinating geographic information and spatial data activities.

Ms. Lukas discussed the 3D Elevation Program (3DEP), a national elevation data set that contains 125 years of data. She discussed how data acquisition has improved during that time, especially noting the improvements made with lidar. She also explained the National Enhanced Elevation Assessment, and how USGS estimated annual benefits of conducting the assessment, especially for Federal agencies. There is potential benefit of \$1.2 billion across all business uses.

Among other goals, Ms. Lukas said the 3DEP was intended to: (1) address the mission-critical requirements of Federal agencies, States, and others documented in the National Enhanced Elevation Assessment; (2) apply lidar technology to acquire and distribute 3D data; (3) increase the quality level of lidar used to enable more accurate understanding, modeling, and prediction; (4) leverage collaboration among partners to increase the overall investment in 3D data; and (5) systematically complete national 3D data coverage in eight years. To help advance the 3DEP program, she said that USGS is actively promoting the program to its partners and recently issued a Broad Agency Announcement (BAA) that provides information on how agencies can partner with the USGS to acquire 3D data. Ms. Lukas said that USGS has worked with FEMA to provide 3DEP as its base program for lidar and has also contributed funding for the program. The 3DEP has received endorsements from multiple organizations, including the American Association of State Geologists, the Management Association of Private Photogrammetric Surveyors (MAPPS), and the National Society of Professional Surveyors.

Finally, Ms. Lukas provided an overview of USGS' National Hydrography and Watershed Boundaries Datasets, which allows for modeling and tracing water downstream or upstream. She said USGS is about to launch a study on the National Hydrography Data Requirements and Benefits to determine the next generation of hydrography data. Additionally, USGS supports the Open Water Data Initiative, which ensures access to and interoperability of water data. She then opened the floor to member questions.

Ms. Durham noted that, several years ago, the Government prioritized efforts to collect lidar data but that information did not appear to be reflected on the maps Ms. Lukas provided. Ms. Lukas replied that maps were of a lower quality level before 3DEP and that the new standard is for quality level (QL) 2, with QL 5 for Alaska.

Mr. Jones asked how often lidar collection should be updated to keep pace with technology. Ms. Lukas replied that 3DEP is initially focused on obtaining one cycle of national coverage, but the program anticipates that the value of this foundation will grow with the ability to compare repeat coverages with the baseline that 3DEP will establish. Mr. Dorman noted that in North Carolina, it was 10 years before the State began its second collection effort.

Ms. Nancy Blyler, TMAC member, asked Ms. Lukas to speak to USGS' current data management system. Ms. Lukas explained that there is a repository and it is consolidating operations and inputs around The National Map.

Mr. Dorman thanked Ms. Lukas and introduced Mr. Amar Nayegandhi, MAPPS/Dewberry, to provide the private sector's perspective on data collection and maintenance. Mr. Nayegandhi provided an overview of his organization and discussed the differences between linear and Geiger lidar:

- Traditional, or linear, lidar uses individual laser beams to measure range. It can operate at over 500 KHz and altitudes of up to 15,000 feet, making it efficient for wide area mapping.
- Geiger mode, or photon-counting, lidar uses the return of individual photons instead of laser beams. It uses significantly lower energy and can operate at much higher altitudes. Geiger mode can collect thousands more measurements—and at a faster rate—than traditional lidar.

Mr. Nayegandhi explained that Geiger mode lidar can reduce costs of collection across a wider range of collection densities. He stated that industry is currently developing Geiger mode lidar sensors and that the International lidar Mapping Forum Conference in February 2015 includes presentations on Geiger mode lidar.

He also noted that topobathymetric (topo) lidar is an airborne remote sensing technique used to measure the height of the surface on land and underlying bodies of water, such as streams, lakes, rivers, and shallow coastal areas. Using topo lidar eliminates the need for an individual to physically measure the depth of any given body of water. He also explained several commercial topo lidar products, such as Leica AHAB Chiroptera and Optech CZMIL. He provided several data slides depicting the accuracy of physical measurements compared to those with topo lidar, noting their similarity, and also provided information on topo lidar project in 2013 following Hurricane Sandy, Assateague Island, and Hatteras Island. Regarding building imagery, today's lidar capabilities are extremely accurate.

Mr. Nayegandhi provided an update on the various types of satellite imagery and capabilities, including Digital Globe's World View-3 (WV3) satellite and Google Skybox satellites. The Skybox satellites are relatively inexpensive and two have already been launched. He also said that the American Society for Photogrammetry and Remote Sensing has recently released an updated standards document that better addresses current technologies and includes standards for digital orthoimagery, digital planimetric data, and digital elevation data. It also includes additional accuracy measures for orthoimagery seam lines, aerial triangulation accuracy, and lidar relative swath-to-swath accuracy, among others. Finally, Mr. Nayegandhi explained how lidar helps support the 3DEP program run by Ms. Lukas.

Members had no additional questions for Mr. Nayegandhi.

### **Future Conditions**

Mr. Jerad Bales, Chief Scientist for Water, USGS, provided a briefing on flood forecasting and current understanding of possible changes in future flood conditions in the United States. He also discussed USGS flood science and data activities, noting that the USGS works closely with the National Weather Service.

Mr. Bales said that there have been very few significant long-term trends in flooding during the last approximately 120 years, other than those associated with changes in land-use and/or water management. He continued that the observed magnitude of climate change impacts on riverine flooding is relatively small to date, but it will take a long time for changes in rare, extreme events (such as the one-

percent annual exceedance probability flood) to affect long-term trends. There is good evidence, however, that coastal flooding due to sea level rise is increasing. Additionally, land subsidence due to groundwater withdrawal is increasing in the United States, which makes some areas more susceptible to flooding. The amount of precipitation occurring in the largest storms, however, does appear to be increasing, which could lead to an increase some flooding, particularly in urban areas.

Mr. Doug Marcy, Coastal Hazards Specialist, National Oceanic and Atmospheric Administration (NOAA), provided a presentation on measurement and future sea level rise scenarios. Mr. Marcy stated that there are 210 stations in the National Water Level Observation Network and that tide gauges collect hourly data. The information is then compiled into reports every 19 years. He stated that sea level measurements from satellite altimetry images show that there is a vast variability in sea level trends. There are some areas where sea levels are falling, such as the coast of Northeastern United States, and others where sea level is rising, like in Southeast Asia. Various factors can cause the sea level to change, including thermal expansion and water exchange with continents. Over the past 400,000 years, sea levels have fluctuated and are currently among the highest points ever estimated.

Mr. Marcy stated that scientists used risk framing to determine the climate model for different scenarios to determine the socio-economic impact, as well as the ecological impact of sea level rise. Planning for multiple future states ensures that scientists are prepared for any outcome. He also stated that the degree of risk tolerance varies based on flexibility to accommodate flooding, the consequences of the event, and the ability or inability to change in the near term. Finally, Mr. Marcy provided an overview of several tools available to help calculate risk, including the Sea Level Rise Tool for Hurricane Sandy and reports such as “A Network Gaps Analysis for the National Water Level Observation Network” and the “Sea Level Rise and Nuisance Flood Frequency Changes around the United States.”

Mr. Steve Ferryman, TMAC member, commented that the global climate change models are not good for riverine modeling and asked if there were other models that could be applied for riverine environments. Mr. Marcy replied that global change scenarios are not advanced enough to be applied to riverine environments. Mr. Dorman commented on the uncertainty among climate change models. Mr. Mason also commented that much of the conversation is centered on sea level rise, but that the council and Federal agencies also need to consider the effects of storm surge.

### **Risk to Insurance Rating**

Mr. Paul Kovacs, Executive Director at the Institute for Catastrophic Loss Reduction, presented on the Canadian model for risk tolerance, prevention of urban damage, the role of insurance, and communicating risk. Mr. Kovacs commented that urban flooding has surpassed fires as the most significant cause of damage to Canadian homes, noting increases in precipitation over the past several decades. He discussed how Canadians prevent flood damage and that officials typically examine water flow when deciding risk.

Mr. Kovacs stated that Canadians have a much higher flood tolerance than in the United States, and the tolerance varies by province. Canadian communities are building between the 300-700 year flood event—not the 100 year event as done in the United States. Regarding the role of insurance, he stated that there is no mandated riverine flood insurance in Canada, though it is something the government is currently examining. Mr. Kovacs also said that Canadian officials also continue to study the best way to communicate risks to the public, noting the vast discrepancy on the level of detail requested by various individuals.

Ms. Christine Shirley, TMAC member, commented that for urban flooding, a central reason people do not purchase flood insurance is because they can file claims against the city. Therefore, insurance should be aimed at the cities if this practice is to continue. Mr. Kovacs replied that the insurance companies will typically pay claims immediately but will also seek damages from the city if they believe the city was at fault. He explained a recent lawsuit insurance companies won against Canadian cities because the insurance companies felt they were partially liable for the flooding. He also stressed the liability of

individual homeowners. Mr. Bellomo also commented that U.S. Federal insurance funds are not intended for home repairs, but rather for immediate housing and food for the residents.

Mr. Kunreuther asked how Canada is addressing the tension between affordability and premiums. He also asked if Canada has considered about multiyear policies. Mr. Kovacs responded that the Canadian insurance industry is highly competitive and that there is no regulation on premium rates. Incentives that are used by one company will impact premiums. Additionally, multiyear policies have not been introduced, but could be used in the future.

A conversation began between Mr. Kovacs and Mr. Bellomo concerning the private Canadian insurance market. Mr. Bellomo asked if there was ever a situation where the companies refused to insure someone because their risk was too high. Mr. Kovacs responded that there has never been an issue with individuals not getting insurance coverage.

Mr. Jones asked if the companies that write flood insurance policies tie their rates to provincial maps. Mr. Kovacs responded that the companies are only using the maps because there is no other information available to them; however, insurance companies are actively considering pooling resources to create new maps. He also said that he is unaware of any location or company that bases rates on structures alone.

### **Database, Mapping and Digital Display**

Mr. Richard Fogleman, Technical Director, Geographic Information Systems, AECOM, provided a presentation on digital data and next generation mapping systems and technologies. Mr. Fogleman said that digital data has many benefits, including that it provides the opportunity to create production/process efficiencies and drives users to results faster and more accurately. It can also meet FEMA requirements, reduces data redundancy, and allows the user to perform studies without cultural constraints. He discussed four components of the all-digital environment:

- Next Generation Comprehensive Geodatabase Design's vision is to support digital data and outputs, promote cost effectiveness, and preserve historic data, among others. He discussed the benefits of the system and provided the TMAC with an overview of how the system is used.
- Next Generation Data Population and Development allows for new studies, accounting for back population (which helps identify anomalies in the data), and Raster dataset development. He discussed the benefits of the system, discussed case studies in Virginia and Alabama, and provided the TMAC with an overview of how the system is used.
- Next Generation Data Management and Tools offer quality control, data transfer and maintenance.
- Next Generation Data Applications offer numerous possibilities with consolidated digital data, including interacting with additional platforms.

Mr. Bellomo polled TMAC members to understand if any of their organizations are using any of these systems or if they are using older technologies. Ms. Small replied that her organization uses its own system. Mr. Dorman also commented that North Carolina does a significant amount of digital work and that it has drastically reduced the time to analyze the data. Ms. Grassi asked about the resources it takes to move a State to these types of systems. Mr. Dorman replied that it costs approximately \$100,000 for a State to be brought into the system. Ms. Durham noted that data preparation was a significant component to digitizing the State of Alabama's data, and costs went beyond Mr. Dorman's estimate. Mr. Dorman thanked Mr. Fogleman for his presentation.

### **Risk Assessment and Mapping**

Mr. Eric Berman, HAZUS Program Manager, FEMA, provided a briefing on the HAZUS Multi-Hazards (HAZUS-MH) tool, its uses, product suite, and pending system modifications. He explained that HAZUS-MH is a risk assessment software program for analyzing potential losses from floods, hurricane winds, and earthquakes. In HAZUS-MH, current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before, or after, a disaster occurs. He noted this allows us to see the physical, economic, and social impacts. The system started 25 year ago.

Within HAZUS-MH, the flood module methodology has four components: (1) define hazard: flood surface, land surface; (2) define and overlay inventory; (3) determine damage; and (4) estimate losses. He then reviewed results generated from an automated hydrology and hydraulic model, including the model's benefits. Mr. Berman stated that the data required for a flood analysis varies based on country, city, and community responses.

Mr. Berman discussed the Comprehensive Data Management System (CDMS), which is a complimentary tool to HAZUS-MH that provides users with the capability to update and manage statewide datasets. He said local analysts need to bring in their own data. He pointed out that HAZUS is a tool but his office still seeks partnerships with others to bring in their data.

Mr. Berman referenced the Risk MAP Lifecycle figure and noted the four steps are to identify, assess, communicate, and mitigate risk. He also briefly discussed the various non-regulatory projects that are compiled. Finally, he said there are four pending updates to Risk MAP, addressing subjects such as dasymetric data development.

Mr. Gale Fraser, TMAC member, asked if HAZUS accounts for loss of life. Mr. Berman said some models have been created for dam breaks and flash floods; however, creating a model for the slow rise water is difficult.

Ms. Grassi asked how this program applies to complex urban environments since it does not model basement apartments or high buildings over six floors. She also inquired about the economic impact on urban areas, such as Wall Street, as these urban environments and communities often experience different types of impacts than the rest of the country. Mr. Berman said FEMA is building a framework for these types of cases.

Mr. Butgereit said the State of Florida has two GIS staff running HAZUS. He recommended that FEMA resurrect the previous CDMS web portal to exchange old data to sustain these data sets. He said if information is missing or wrong, then it should be dismissed and thrown away. Mr. Berman said there are some loss or avoidance studies and there have been some opportunities to discuss this issue with States.

### **Program Metrics/Annual Survey Results**

Ms. Tucker Mahoney, Coastal Program Specialist, FEMA, discussed an overview of the FEMA key decision point (KDP) process, which is FEMA's intentional, coordinated, project management decision-making that supports consistent data collection and management for all flood risk projects. Decisions at each KDP will be documented and submitted via the KDP Documentation Tool on the Risk MAP portal. She said that FEMA is implementing the KDP process to provide more efficient and timely response to data calls, streamline communications between the Regions and HQ, and create transparency of key management decisions. She then discussed each of the six KDP steps.

- KDP 0, Initiate a Flood Risk Project: In this step, FEMA captures Cooperating Technical Partners (CTP) goals and objectives, external stakeholder recommendations, potential for change in flood hazard, and impact on metrics to determine if it should conduct a new project.
- KDP 1, Continue Flood Risk Project: In this step, FEMA examines evidence collected in KDP 0 and makes a determination of whether or not to begin the project, also considering compliance with BW-12 and the *Homeowners' Flood Insurance Affordability Act*, results of the first order of approximation, and data and funding available to support the project.

- KDP 2, Develop Preliminary FIRM: In this step, FEMA conducts community engagement, develops a non-regulatory product distribution plan, and provides a summary of levee impacts, if there are any.
- KDP 3, Distribute Preliminary FIRM: In this step, FEMA resolves the quality reviews (QR), updates the Mapping Information Platform and CNMS, and holds a revised preliminary discussion, if applicable.
- KDP 4, Initiate an Appeals Period: In this step, FEMA confirms QR resolution and Technical Support Data Notebook completion, confirms its due process, and opens an appeal docket.
- KDP 5, Issue Letter of Final Determination: In this step, FEMA conducts community and congressional engagement, resolves all appeals, and issues a letter of final determination.

She noted that FEMA will formally implement this process starting in January 2015, and that FEMA would be receptive to stakeholder feedback on the program as it rolls out. Ms. Mahoney also said that this is a qualitative process to allow flexibility and it will apply to both new and existing projects (though not applied retroactively). Costs should also be absorbed in regular program budgets.

Ms. Grassi asked about the timeline for the KDP process. Ms. Mahoney said that there is no defined process for when a new project would begin and that FEMA HQ staff works closely with the regional staff to determine when updates are needed. She also noted that CNMS may provide insight on studies that might need to be updated. She also added that FEMA has committed to a 13-day turnaround to resolve any issue or inquiry from the regions or communities.

Mr. Ferryman asked if the results of the KDPs are public, to which Ms. Mahoney confirmed they are.

### **Adjournment**

Mr. Dorman thanked participants for the discussion and reminded members to please review the recommendations spreadsheets. Members should send their inputs to him and Ms. McConkey. The meeting would resume at 8:00 a.m. on December 5, 2014.

## **Day Two**

### **Call to Order**

Mr. Crowell opened the meeting, provided an overview of the facility's logistics, and took roll call of TMAC members. He then introduced Mr. Dorman to facilitate the remainder of the day.

### **Public Comments**

Mr. Crowell announced that per FACA, members of the public were invited to provide written comments on the issues to be considered by the TMAC. He noted that those comments were to be submitted and received by November 25, 2014, as noted in the Federal Register Notice. In addition, those interested in speaking at the meeting should have registered as a speaker by November 25, 2014. He requested that speakers limit their comments to no more than three minutes and said that the public comment period will not exceed 30 minutes.

Mr. Mark Romano, Harris Corporation, said that there have been a lot of discussion and questions about modeling, and he is not a floodplain engineer. He said there are new technologies brought to bear for super high resolution data sets, but did see that the question on diminishing returns was answered. Mr. Romano would like to know if there is an additional study being done because he had not heard discussion on post damage assessments and how that may be brought to bear.

### **Engineering/Study Production (Riverine; Levee; Coastal)**

Dr. Ty Wamsley, Division Chief, Flood and Storm Protection Division, Coastal and Hydraulics Laboratory, U.S. Army Corps of Engineers (USACE), said USACE has numerous next generation tools under development for the simulation of flood inundation in both coastal and inland environments. He said that spatially distributed hydrologic models can provide increased accuracy in runoff simulation capability and advanced hydrodynamic models provides accurate simulation of 2D overland propagation of flood waves due to levee breaches and dam break simulations. He also noted that coupling wind, wave, and circulation models in coastal settings provides increased accuracy of storm surge simulation and that coupling coastal and inland modeling capabilities provides accurate predictions of flooding impacts from coastal storms and hurricanes even in urban settings.

Dr. Wamsley discussed several specific programs and provided examples of how each has been applied.

- Gridded Surface Subsurface Hydrologic Analysis (GSSHA), which is a spatially-distributed hydrologic and environmental simulation. He provided several examples of how this tool is applied.
- Adaptive Hydraulics (ADH) modeling, which is a next-generation adaptive hydrodynamic and sediment transport simulation in riverine and estuarine environments, is built to take advantage of multi-processor and supercomputing platforms for greatest performance. He provided several examples of how this tool is applied.
- Coastal Storm Modeling System (CSTORM-MS), which provides next generation coastal modeling, including a tightly coupled suite of hydrodynamic, wind, wave and sediment transport simulation capabilities for coastal applications.
- PhaseWave, which is a Boussinesq model for simulation of wave run up and overtopping due to complicated coastal conditions and wave dynamics. It is under development.
- CSHORE, which provides advances in morphology response, including one-dimensional phase-averaged surf zone dynamics model for simulating wave transformation, run-up, and overtopping as well as beach and dune erosion.

Mr. Mallory asked which of these models can be applied to floodplain management and how the technologies may evolve in the next five years. Dr. Wamsley replied that the GSSHA model does not require working on a supercomputer and can be downloaded and used now. The computing capacity needed would directly correlate to the area one is intending to cover. For example, a county may be covered by a single processor, whereas a supercomputer might be needed for an entire state. Other models besides GSSHA are available through the Web site Aquaveo. He also said that most of the USACE models have also been approved for FEMA use. Ms. Lathrop asked how the models are evaluated for approval. Mr. Bellomo replied that there are a series of regulations that a program must meet and that all programs are rigorously reviewed and tested for them to be accepted.

Mr. DeMulder asked about the timeframes required to run the models. Dr. Wamsley replied that it takes four to five hours to get quick results and that the response time depends on resolution; lower resolution requests are processed faster than higher resolution requests.

### **Current & Future Possibilities: Delegation**

Ms. Erin Cobb, CTP Program Specialist, FEMA, provided an overview of the CTP Program and how it has evolved since its initial establishment. For example, in previous programs, as partner in-house capabilities decreased, the Federal funding and support would also decrease; however, currently, if partnership capability decreases, Federal funding and support will increase to maintain a level of effort. Today, more activities are supported through Federal funding than at the State and local levels.

Ms. Cobb said that CTPs are a key component of Risk MAP. She also shared her perspective on the current successes of the CTP Program, as well as potential improvements that should be made, specifically addressing consistency and transparency, laws and policy, training, collaboration, and performance. She outlined the requirement to utilize partners in mapping and stated the primary objectives of the program have evolved over time to consider the realities of local prioritization and constraints, which impact map delivery of the maps. She shared how FEMA works to establish a model that will provide support to CTPs where necessary, but does not dictate how a local community will conduct the activities in which they select to be involved.

Ms. Cobb outlined the CTP Program's challenges in collecting, tracking, and measuring CTP performance, and that it will become more important for FEMA to identify and implement various types of performance tracking activities. CTPs are currently allowed to select the activities in which they are interested in participating and recuse themselves from other activities. Ms. Cobb completed her presentation by stating that the impact of the CTP Program is still unknown, but she is expecting coming changes in grants management to facilitate consistency and transparency. She also reminded the council that the CTPs' activities and level of engagement vary significantly from jurisdiction to jurisdiction. She stated that the program needs well-defined performance metrics, a strong delegation framework, and a defined career path for partners; however, the program also needs the option to maintain the CTPs and allow them to form their program, while remaining adaptable to incorporate new technologies.

Mr. Chad Berginnis, Association of State Flood Plain Managers (ASFPM), first provided a history of his organization. He then discussed how delegating responsibilities and authority to State and local partners will continue to play a significant role in the success of mapping, noting that FEMA will never have enough resources to adequately complete all flood mapping activities. He encouraged the Committee to consider how delegating might be used to successfully achieve FEMA's mapping goals. Specifically, he cited the Clean Air Act, noting how the structure of that program requires States to carry out Federal program objectives. He stated that there are different levels of delegation (basic, intermediate, and advanced), and that FEMA's primary role would be to set standards, monitor and enforce the standards, and provide technical assistance and coordination. Each level of delegation provides its own unique benefits, including having certainty for long term planning and creating efficiencies. Mr. Berginnis completed his presentation by outlining next steps that the council and/or FEMA may wish to consider as it reforms flood mapping programs.

Ms. Durham asked Ms. Cobb about the matching funding requirements for CTPs. Ms. Cobb replied that there has never been a statutory requirement for CTPs to match Federal funding, but in legislative reports, language suggested that FEMA receive a 25% match from CTPs.

Mr. Mallory asked if the Letter of Map Change (LOMC) Delegation program is being expanded. Ms. Cobb replied that FEMA is still considering expanding the existing pilot program, but has no definite plans to do so. Mr. Bellomo stated that FEMA largely delegates the National Flood Insurance Program (i.e. floodplain mapping to the States, and insurance and adjudication to Write-Your-Own companies), but has not completely delegated the mapping program to its partners.

Ms. Grassi asked how CTPs can collaborate and share lessons learned. Ms. Cobb replied that FEMA holds a twice yearly training course that has been attended by approximately 40% of its CTPs. The topics discussed during the trainings are based on changes to the program. FEMA also supports peer training, collaboration, and education. TMAC members shared other organizations that enable the CTPs' coordination, such as ASFPM and NAFSMA.

Mr. Kunreuther noted that he recently discussed the Clean Air Act implementation and delegation with Federal officials and stakeholders, several of whom did not have adequate resources to carry out the Act's provisions. He said that engaging the private sector may help alleviate some of the burden on State and local agencies.

Ms. Durham asked how FEMA handles compliance for delegated activities. Mr. Bellomo stated that the types of enforcement measures vary based on the activities delegated and that enforcement measures may include sanctions. Mr. Bellomo also stated that, from a budgeting perspective, if FEMA were able to

increase its delegation activities, this could allow FEMA to spend saved money to increase its research and development activities.

### **Examples of Next Generation Flood Risk Management**

Ms. McConkey shared details of the work she oversees for the Illinois State Water Survey and the elements of the program that contribute to its success. She first discussed the evolution of the program, outlining the history of her organization's CTP agreements with FEMA and the unique structure her organization has with two statewide CTPs. Ms. McConkey shared examples of paper maps that are still in use throughout the State. She also noted that since her organization has the ability and resources to do other types of work within the State. Her staff currently consists of 10 engineers, 10 GIS experts, and two outreach experts, and her organization does not contract work to other companies. .

Ms. McConkey shared that her team's activities include discovery, deployment and mitigation action, hydrology and hydraulics, floodplain mapping and flood insurance studies, as well as development of non-regulatory products. In addition, her staff members attend community meetings and manage comments, appeals, revalidation letters, and Letter of Map Revision delegation. Ms. McConkey observed that the engagement in projects from start to finish was a strength of the program, and also noted the importance of precipitation, stream gage, and lidar data for flood studies. Ms. McConkey shared one example of a community where a lower income/socio-economic neighborhood was remapped and determined to be at risk. Through strong community engagement, documentation, and clear messaging, the community accepted its risk and is taking action to reach out to citizens and develop mitigation plans. Moving forward, Ms. McConkey's goals are to digitize maps, as many paper maps are still used; validate and update stream miles, as only 18% of Illinois' stream miles are currently valid; develop statewide mitigation priorities; focus efforts on a smaller watershed scale; and delegate program responsibilities where appropriate and necessary.

Ms. McConkey concluded with these summary points:

- Statewide CTPs is an advantage for the NFIP and Mapping Program
- CTPs carefully assess capabilities and assume appropriate tasks
- Capable States and CTPs are delegated more responsibility in resource allocation, leverage knowledge
- Community engagement throughout a mapping project vital to quality data and community acceptance
- A strategic plan is needed to update all mapping to appropriate level
- Metrics and program rules drive decisions and without careful formulation lead to unanticipated outcomes

Ms. Grassi shared her experience working in New York City and the development of PlaNYC. She first outlined the work and analyses the city undertook following Hurricane Sandy and the risks of climate change to the city. One challenge that New York City officials anticipate as a result of climate change is an increase in average temperature, and 4–11% increase in rainfall and higher sea levels by 2050. In addition, she noted that city officials are currently working to update its flood data and FIRMs, which were last updated in 1983. One of the tasks was to develop models to understand population and structure growth predictions. As a result of scenario-based modeling, Ms. Grassi said that the city deduced multiple findings and stated that it now expects that New York City will be subject to regular tidal flooding in 2050.

Ms. Grassi discussed details of PlaNYC, a sustainability and resiliency initiative that addressed four key challenges, including growth, infrastructure, global economy, and climate change, as well as communicating across disciplines. New York City's resiliency plan, *A Stronger, More Resilient New York*, was first established after Hurricane Sandy to address three questions: (1) what happened during Sandy and why; (2) what could happen in the future; and (3) how do we rebuild post-Sandy and prepare for a future with climate change. For example, New York City is beginning to implement upgrades to its

building codes, as well as examine mitigation actions to address the unique building structures and styles that exist in the city. It is also looking at ways to enhance resiliency, strengthen coastal defenses, protect infrastructure and services, will begin developing a consumer campaign focused on flood risk education and working with FEMA in light of New York City's unique and historical development.

Mr. Ken Ashe, Assistant Program Director, Floodplain Mapping Program for the State of North Carolina, shared his experience with digitizing and delivering data in real-time. He provided an overview of the State of North Carolina, including that it contains approximately 10,000 square miles of special flood hazard area. He said that the catalyst for revamping the state's mapping program was Hurricane Floyd (1999), in which 80% of buildings damaged during the storm were not included in a SFHA. He said that North Carolina then began a plan to have full delegation for many mapping related activities, including engineering and surveys, FIRM generation, and community engagement. The State has since achieved all planned activities from its 2000-2008 vision, which included over 30,000 stream miles of study and approximately 10,000 FIRM panels; creating a spatially enabled Flood Mapping and Alert System application; and acquiring statewide lidar-derived elevation data.

Once those activities were completed, North Carolina began planning its 2<sup>nd</sup> generation vision, including transitioning from flood hazard mapping to structure-based flood hazard risk management and from cartographic mapping to database-driven digital display. Mr. Ashe discussed how the State progressed to an integrated hazard risk management and the components that have been critical to implementing the vision, including high-resolution spatial data. He said that by focusing on risk and data accuracy, his program found it could achieve savings (in one case, cost savings of 2.6% beyond savings from production efficiency). Mr. Ashe noted some obstacles including the lack of stable funding, ever-increasing need for administrative requirements, and the lack of flexibility that is often found.

### **Adjournment**

Mr. Dorman and Mr. Crowell thanked members and Mr. Crowell adjourned the TMAC meeting.

### **Action Items**

- FEMA will provide copies of presentation slides and materials to TMAC members prior to the meeting.
- TMAC members will review the recommendations matrix summary and alert members to additional recommendations that the TMAC should consider.

### **Appendices**

- TMAC Meeting Agenda
- TMAC Meeting Presentation Deck

### **Certification**

*I hereby certify that, to the best of my knowledge, the foregoing minutes are accurate and complete.*

 2/5/15

John Dorman  
TMAC Chair