



TMAC

FUTURE CONDITIONS REPORT INTERIM

October 2015

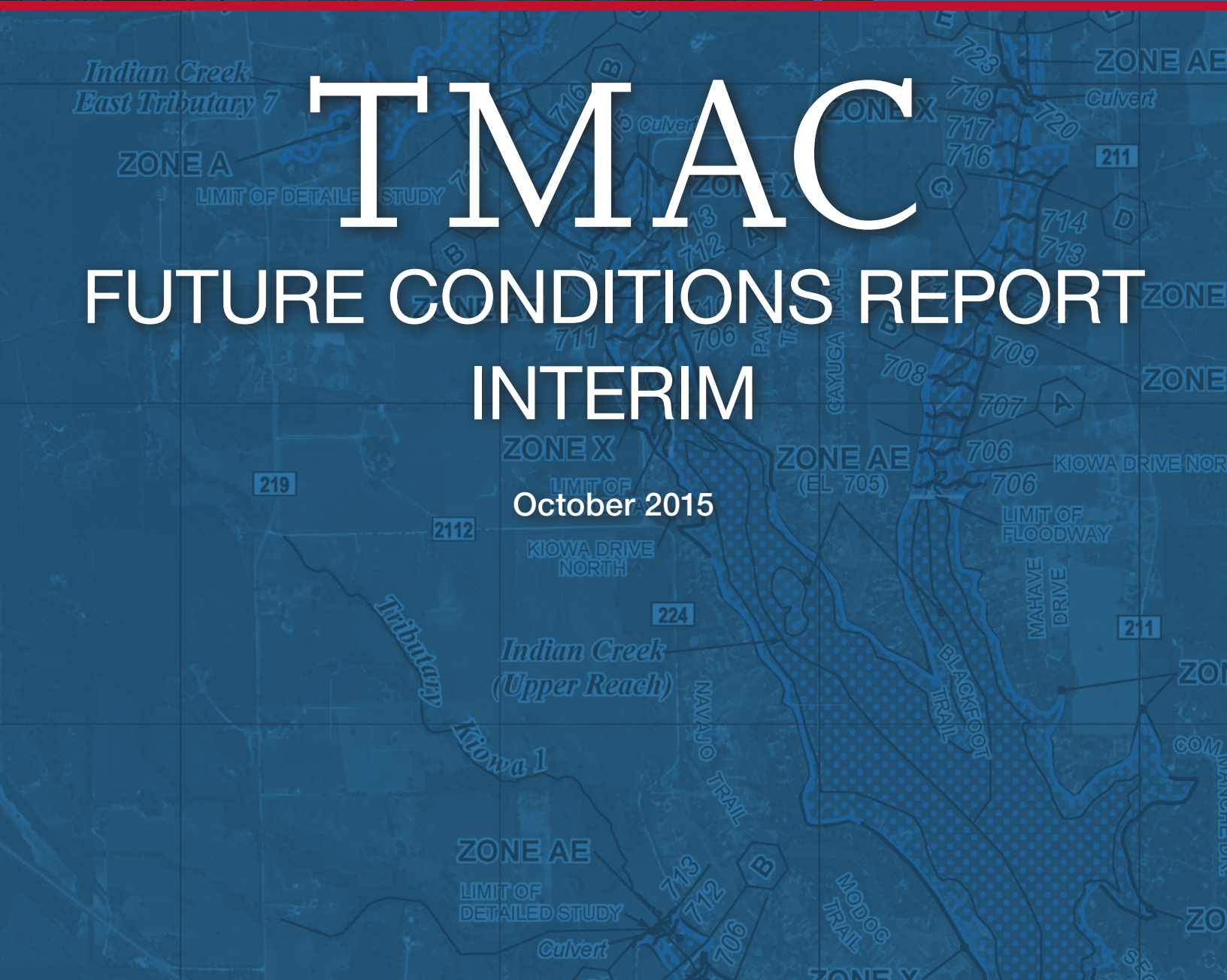


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1. Introduction

The Technical Mapping Advisory Council (TMAC) is a Federal advisory committee established to review and make recommendations to the Federal Emergency Management Agency (FEMA) on matters related to the national flood mapping program. The purpose of this report, and the TMAC Charter, responsibilities, and duties are outlined below.

1.1 Purpose

The purpose of this report is to provide FEMA recommendations for incorporating the best available climate science and using the best available and methodologies when considering the impacts of sea level rise and future development on flood risk.

1.2 Congressional Charter

Pursuant to section 100215 of the *Biggert-Waters Flood Insurance Reform Act of 2012* (BW-12), Public Law 112-141, 126 Stat. 924, 42 U.S.C. § 4101a, the charter filed with Congress on July 29, 2013 formally established the TMAC. The TMAC was established in accordance with and operates under the provisions of the *Federal Advisory Committee Act* (FACA) (Title 5, United States Code).

The full TMAC Charter, which outlines the principles and functions of the Council, including objectives and scope of TMAC activities, description of duties, member composition, frequency of meetings, and other pertinent items relating to the Council's establishment and operation is located in the Appendix.

1.3 TMAC Responsibilities

The TMAC provides advice and recommendations to the Administrator of FEMA to improve the preparation of Flood Insurance Rate Maps (FIRM) and flood hazard information. Among its specified statutory responsibilities, the TMAC examines performance metrics, standards and guidelines, map maintenance activities, delegation of mapping activities to State and local mapping partners, interagency coordination and leveraging, and other requirements mandated by the authorizing BW-12 legislation.

The TMAC Bylaws, which establish and describe rules of conduct, regulations, and procedures regarding Council membership and operation, are located in the Appendix.

1.4 TMAC Duties

The TMAC is required to make recommendations to the FEMA Administrator on:

1. How to improve, in a cost-effective manner, the (a) accuracy, general quality, ease of use, and distribution and dissemination of FIRMs and risk data; and (b) performance metrics and milestones required to effectively and efficiently map flood risk areas in the United States;
2. Mapping standards and guidelines for (a) FIRMs; and (b) data accuracy, data quality, data currency, and data eligibility;
3. How to maintain, on an ongoing basis, FIRMs and flood risk identification; and

4. Procedures for delegating mapping activities to State and local mapping partners, including (a) Methods for improving interagency and intergovernmental coordination on flood mapping and flood risk determination; and (b) a funding strategy to leverage and coordinate budgets and expenditures across Federal agencies.

Per BW-12, the TMAC must also develop recommendations for incorporating the best available climate science in flood insurance studies and maps and using the best available methodology when considering the impacts of sea level rise and future development on flood risk. This is the focus of this report. The legislative language is located in Figure 1.

Biggert-Waters 2012 Mandate from Section 100215(d)

FUTURE CONDITIONS RISK ASSESSMENT AND MODELING REPORT.—

(1) IN GENERAL.—The Council shall consult with scientists and technical experts, other Federal agencies, States, and local communities to—

(A) Develop recommendations on how to—

(i) Ensure that flood insurance rate maps incorporate the best available climate science to assess flood risks; and

(ii) Ensure that the Federal Emergency Management Agency uses the best available methodology to consider the impact of—

(I) The rise in the sea level; and

(II) Future development on flood risk; and

(B) Not later than 1 year after the date of enactment of this Act, prepare written recommendations in a future conditions risk assessment and modeling report and to submit such recommendations to the Administrator.

Figure 1: Future Conditions Report legislative language

1.5 TMAC Creation and Composition

Since the National Flood Insurance Program's (NFIP) inception in 1968, additional legislation has been enacted to encourage community participation in the national flood mapping program, strengthen the flood insurance purchase requirement, and address other priorities. BW-12 sought to make the program more financially sound, directing FEMA to raise flood insurance rates to reflect true flood risk along with other changes. BW-12 also directed FEMA to re-establish and revise the composition of the TMAC, which was originally established for a five-year period under the National Flood Insurance Reform Act of 1994.

Current TMAC members were appointed based on their demonstrated knowledge and competence regarding surveying, cartography, remote sensing, geographic information systems, or the technical aspects of preparing and using FIRMs. In addition, the legislation requires that the TMAC's membership have a balance of Federal, State, local, and private members, with geographic diversity, including representation from areas with coastline on the Gulf of Mexico and other States containing areas identified by the Administrator as at high risk for flooding or as areas having special flood hazards.

Per FACA requirements, nominations were solicited through various professional organizations and a public submission process, which was published in the Federal Register. To establish the TMAC as a Federal advisory committee, the FEMA Administrator selected the most qualified candidates in each membership category, ensuring that, together, the nominees provided a

balance of geographically-diverse professional opinions from a mix of State, local, and private sector organizations. Following a rigorous vetting process, FEMA announced the membership and establishment of the Council in July 2014.

TMAC members serve either 1- or 2-year terms, at the discretion of the Administrator, to allow refresh and ensure the required expertise is represented. The FEMA Administrator or their designee may reappoint serving members for additional 1- or 2-year periods. When new members must be appointed, the same process that was used to appoint members in 2014 will be followed. Additionally, when the TMAC terminates, all TMAC appointments will also terminate. Current TMAC members and subcommittee members are listed in Table 1 and Table 2, respectively. The TMAC Designated Federal Officers are listed in Table 3.

Table 1: 2015 TMAC Members

TMAC Member	BW-12 TMAC Membership Requirement	TMAC Member Role
Mr. John Dorman, CFM Assistant State Emergency Management Director for Risk Management, North Carolina Emergency Management	State Cooperating Technical Partner Representative	TMAC Chair Annual Report Subcommittee Member
Mr. Doug Bellomo, P.E. CFM Senior Technical Advisor, U.S. Army Corps of Engineers	Federal Emergency Management Agency Designee	Member through May 2015 Annual Report Subcommittee Member
Ms. Juliana Blackwell Director, National Geodetic Survey, National Oceanic and Atmospheric Administration	National Oceanic and Atmospheric Administration (NOAA) / Commerce for Oceans and Atmosphere Designee	Annual Report Subcommittee Member Future Conditions Subcommittee Member
Ms. Nancy Blyler Lead, Geospatial, Community of Practice, U.S. Army Corps of Engineers	U.S. Army Corps of Engineers Designee	Annual Report Subcommittee Member Future Conditions Subcommittee Member
Mr. Richard Butgereit, GISP GIS Administrator, Florida Division of Emergency Management	State Geographic Information System (GIS) Representative	Annual Report Subcommittee Member
Mr. Mark DeMulder Director, U.S. Geological Survey National Geospatial Program (Ret.)	U.S. Geological Survey Representative	Annual Report Subcommittee Member
Ms. Leslie Durham, P.E. Floodplain Management Branch Chief, Office of Water Resources, Alabama Department of Economic and Community Affairs	State Cooperating Technical Partner Representative	Annual Report Subcommittee Chair

TMAC Member	BW-12 TMAC Membership Requirement	TMAC Member Role
<p>Mr. Scott Edelman, P.E. Senior Vice President, North America AECOM Water Resources</p>	<p>Mapping Member <i>[Recommended by Management Association for Private Photogrammetric Surveyors (MAPPS)]</i></p>	<p>Future Conditions Subcommittee Chair</p>
<p>Mr. Steve Ferryman, CFM Mitigation and Recovery Branch Chief, Ohio Emergency Management Agency</p>	<p>State Mitigation Officer</p>	<p>Future Conditions Subcommittee Member</p>
<p>Mr. Gale Wm. Fraser, II, P.E. General Manager and Chief Engineer, Clark County (Nevada) Regional Flood Control District</p>	<p>Regional Flood and Stormwater Member <i>(Recommended by National Association of Flood and Stormwater Management Agencies)</i></p>	<p>Annual Report Subcommittee Member</p>
<p>Ms. Carrie Grassi Deputy Director for Planning, New York City Mayor's Office of Recovery and Resiliency</p>	<p>Local Cooperating Technical Partner Representative</p>	<p>Future Conditions Subcommittee Member</p>
<p>Mr. Christopher P. Jones, P.E. Registered Professional Engineer</p>	<p>Engineering Member <i>(Recommended by American Society of Civil Engineers)</i></p>	<p>Annual Report Subcommittee Member Future Conditions Subcommittee Member</p>
<p>Dr. Howard Kunreuther James G. Dinan Professor of Decision Sciences and Public Policy, Wharton School, University of Pennsylvania</p>	<p>Risk Management Member <i>(Recommended by the Society for Risk Analysis)</i></p>	<p>Future Conditions Subcommittee Member</p>
<p>Ms. Wendy Lathrop, PLS, CFM President and Owner, Cadastral Consulting, LLC</p>	<p>Surveying Member <i>(Recommended by the National Society of Professional Surveyors)</i></p>	<p>Annual Report Subcommittee Member</p>
<p>Mr. David Mallory, P.E., CFM Program Manager, Floodplain Management Program, Urban Drainage and Flood Control District, Denver, CO</p>	<p>Local Cooperating Technical Partner Representative</p>	<p>Future Conditions Subcommittee Member</p>

TMAC Member	BW-12 TMAC Membership Requirement	TMAC Member Role
Mr. Robert Mason Chief, Office of Surface Water, Department of Interior, U.S. Geological Survey	Department of the Interior (DOI) Designee	Annual Report Subcommittee Member
Ms. Sally Ann McConkey, P.E., CFM, D. WRE Illinois State Water Survey Prairie Research Institute, University of Illinois	State Floodplain Management Member <i>(Recommended by Association of State Floodplain Managers)</i>	Annual Report Subcommittee Member
Mr. Luis Rodriguez, P.E. Branch Chief, Engineering Management Branch, Federal Insurance and Mitigation Administration, FEMA	Federal Emergency Management Agency Designee	TMAC Member (beginning May 2015) Annual Report Subcommittee Member
Mr. Javier E. Ruiz Acting Director, National Geospatial Center of Excellence, Natural Resources Conservation Service	U.S. Department of Agriculture (USDA) Designee	Future Conditions Subcommittee Member
Ms. Christine Shirley, CFM National Flood Insurance Program Coordinator, Oregon Department of Land Conservation and Development	National Flood Insurance Coordination Office Representative	Future Conditions Subcommittee Member
Ms. Cheryl Small President, Small Consulting LLC	Flood Hazard Determination Firm Member <i>(Recommended by National Flood Determination Association)</i>	Annual Report Subcommittee Member

Table 2: 2015 TMAC Subcommittee Members

TMAC Subcommittee Member	TMAC Role
Ms. Laura Algeo, P.E., CFM Program Specialist, FEMA	Annual Report Subcommittee Member
Mr. Kenneth W. Ashe, P.E., PMP, CFM Senior Associate Engineer, Amec Foster Wheeler Environment & Infrastructure, Inc.	Annual Report Subcommittee Member

TMAC Subcommittee Member	TMAC Role
Mr. Dwayne Bourgeois, P.E. Executive Director, North Lafourche Conservation, Levee and Drainage District	Annual Report Subcommittee Member
Dr. Maria Honeycutt, CFM Coastal Hazards Specialist, National Oceanic and Atmospheric Administration	Annual Report Subcommittee Member
Mr. Douglas Marcy Coastal Hazards Specialist, National Oceanic and Atmospheric Administration	Future Conditions Subcommittee Member
Mr. Andy Neal Actuary, FEMA	Future Conditions Subcommittee Member
Mr. Patrick Sacbibit, P.E. Program Specialist, Federal Emergency Management Agency	Annual Report Subcommittee Member
Mr. Jonathan Westcott, P.E. Coastal Hazards Specialist, Federal Emergency Management Agency	Future Conditions Subcommittee Member
Dr. Kathleen D. White, P.E. Lead, Climate Preparedness and Resilience, Community of Practice, U.S. Army Corps of Engineers, Institute for Water Resources	Future Conditions Subcommittee Member

Table 3: 2015 TMAC Designated Federal Officers

TMAC Designated Federal Officers	TMAC Role
Mr. Mark Crowell Physical Scientist, FEMA	TMAC Designated Federal Officer (DFO) Future Conditions Subcommittee Member
Ms. Kathleen Boyer Program Specialist, FEMA	TMAC Alternate Designated Federal Officer (ADFO)
Mr. Michael Godesky, P.E. Physical Scientist, FEMA	TMAC Alternate Designated Federal Officer (ADFO)

1.6 TMAC Mission and Guiding Principles

The TMAC's mission is to provide counsel to FEMA on strategies and actions that will efficiently and effectively advance the identification, assessment, and management of flood hazards and risk.

The TMAC believes the following guiding principles should underpin the future of the national flood mapping program:

- Credible products
- Efficient implementation
- Stakeholder acceptance
- Effective leveraging
- Financial stability

1.7 TMAC Program Vision and Goals

The TMAC believes the following statement reflects an appropriate end-state vision for the national flood mapping program:

A Nation more resilient to flood hazards through the effective identification and communication of flood hazards risk.

Towards this end-state vision, the TMAC believes the following goals and subsequent recommendations should be established and monitored:

1. Accurate, comprehensive data, models, displays, and risk assessments associated with present and future flood hazards.
2. Time- and cost-efficient generation and process management of flood hazard risk data, models, assessments and displays.
3. Effective utilization of efficient technologies for acquisition, storage, generation, display, and communication of data, models, displays, and risk.
4. Integrated flood risk management framework of hazard identification, risk assessment, mitigation, and monitoring.
5. Strong confidence, understanding, awareness, and acceptance of flood hazard and risk data, models, displays, assessments, and process by the public and program stakeholders.
6. Robust added-value coordination, leveraging and partnering with local, State, Federal, and private sector organizations.
7. Permanent, substantial funding that supports all program resource requirements.

1.8 Activities of the TMAC

As a Federal advisory committee, the TMAC open business meetings are announced to the public in a notice published in the Federal Register and can be viewed at www.federalregister.gov. The notice includes meeting details, the agenda, general information, and direction to the www.fema.gov/tmac public website where interested parties can obtain certified public meeting summaries. These materials were made available for the public comment period 15 days prior to each TMAC meeting. To facilitate public participation, members of the public were invited to provide written comments on the issues to be considered by the TMAC prior to the meetings. In addition, the public was given an opportunity to provide oral comments during designated public comment periods at each meeting.

The TMAC conducted seven in-person public meetings and two virtual public meetings between September 2014 and October 2015 guided by the TMAC mission (Section 1.5) and vision

(Section 1.6) and in accordance with the legislative requirements mandated under BW-12 and the *Homeowner Flood Insurance Affordability Act of 2014* (HFIAA).

Each TMAC meeting was designed to achieve business objectives, including:

- Nominate, deliberate, and vote on TMAC Chair;
- Develop the TMAC vision and mission statement;
- Form and execute the subcommittees;
- Research topics in the form of subject matter expert (SME) briefings; and
- Produce two reports required by BW-12, the 2015 Future Conditions Report and the 2015 Annual Report.

To achieve these objectives, the TMAC met regularly throughout the year to produce two main deliverables for 2015:

1. To provide the FEMA Administrator with an annual report with specific recommendations to improve the effectiveness of the NFIP risk mapping processes and products; and
2. To provide the FEMA Administrator with a report containing recommendations for future conditions risk assessment and modeling.

The TMAC also established subcommittees which met regularly, and presented their work on the 2015 Annual Report and Future Conditions Report at the TMAC public meetings, for TMAC discussion and deliberation. The Future Conditions Subcommittee was formed to consult with scientist and technical experts, other Federal agencies, States, and local communities to develop recommendations on how to ensure FIRMs incorporate the best available climate science to assess flood risks and that FEMA uses the best available methodology to consider the impacts of the rise in sea level and future development on flood risk. Future Conditions Subcommittee members contributed draft content and recommendations for inclusion in the Future Conditions Report deliverable.

A summary of the TMAC meetings and meeting activities is shown in the Appendix.

1.9 Presentations / Research / Subject Matter Experts

As part of the TMAC and Subcommittee agendas, SMEs were invited to present information that was critical in providing the knowledge needed to achieve the TMAC objectives and the production of the final deliverables. Although SME presentations may have been organized by a particular subcommittee, SME presentations were open to all TMAC members. The presentations the TMAC and subcommittees received in 2015 are summarized in the Appendix.

2. Summary and Recommendations

The tables below show the seven primary Future Conditions recommendations from the TMAC as well as sub-recommendations that support the primary recommendations. The sub-recommendations are numbered according to the section in which they appear in the final report, and the numerical order in which they will appear in that section. For instance, Sub-Recommendation 3-1 will be the first sub-recommendation in Section 3 of the final report, and so on. The sub-recommendations indicate the timing and type of change required. For timing, “short-term” means up to two years to implement and “long-term” means greater than two years. A sub-recommendation could be either a short-term or a long-term goal. The TMAC has additionally identified all Future Conditions recommendations as requiring policy change, rather than regulatory or legislative change.

Table 4: Recommendation 1 and Sub-Recommendations

Recommendation 1: Provide future conditions flood risk products, tools, and information for coastal, Great Lakes, and riverine areas. The projected future conditions should use standardized timeframes and methodologies wherever possible to encourage consistency and should be adapted as actionable science evolves.		
Sub-Recommendation		Timing
3-2	FEMA should use future risk assessments to take into account the likelihood of events occurring and their impacts, as well as the associated uncertainties surrounding these estimates.	Short-term
3-4	FEMA should define a future population metric that uses a standard future population database along with various budget scenarios for keeping the data current to predict the percent of the population covered at various points in the future.	Short-term
3-5	FEMA should take into account future development (excluding proposed flood control structures for the base condition/scenario) for future conditions mapping. An additional scenario can be generated that does include future flood control structures.	Short-term
3-6	FEMA should use population growth as an indicator of areas with increased potential flood risk.	Short-term
4-4	FEMA should develop guidance for how local zoning and land use planning can be used to identify where and how land use will change in the future, and incorporate that into local hazard and risk modeling.	Short-term
4-11	FEMA should develop a policy and standards on how to consider and determine erosion zones that are outside of the SFHA as they ultimately affect flooding and environmental conditions within the SFHA.	Short-term
5-2	FEMA should use a scenario approach for future conditions flood hazards calculation and mapping that will allow users to evaluate the robustness of proposed solutions to a range of plausible future conditions including uncertain land use and climate change impacts.	Long-term

Table 5: Recommendation 2 and Sub-Recommendations

Recommendation 2: Identify and quantify accuracy and uncertainty of data and analyses used to produce future conditions flood risk products, tools, and information.		
Sub-Recommendation		Timing
3-2	FEMA should use future risk assessments to take into account the likelihood of events occurring and their impacts, as well as the associated uncertainties surrounding these estimates.	Short-term
3-7	FEMA should publish multiple future conditions flood elevation layers that incorporate uncertainty so as to provide a basis for building designs that lower flood risk.	Short-term

Table 6: Recommendation 3 and Sub-Recommendations

Recommendation 3: Provide flood hazard products and information for coastal and Great Lakes areas that include the future effects of long-term erosion and sea/lake level rise. Major elements are:		
<ul style="list-style-type: none"> • Provide guidance and standards for the development of future conditions coastal flood hazard and risk products. • Incorporate local relative sea/lake level rise scenarios and long-term coastal erosion into coastal flood hazard analyses. <p>Consider the range of potential future natural and manmade coastal changes, such as inundation and coastal erosion.</p>		
Sub-Recommendation		Timing
4-1	FEMA should use a scenario approach when considering shoreline location for the estimation of future conditions flood hazards. At least two scenarios should be evaluated, one in which the shoreline is held at its present location, and another in which the shoreline is eroded according to the best available shoreline erosion data.	Short-term
4-6	FEMA should develop guidance for incorporating future conditions into coastal inundation and wave analyses.	Short-term
4-8	FEMA should develop consistent methods and models for long-term coastal erosion hazard mapping.	Short-term
5-4	FEMA should use Parris et. al, 2012, or similar global mean sea level scenarios, adjusted to reflect local conditions, including any regional effects (Local Relative Sea Level) to determine future coastal flood hazard estimates. Communities should be consulted to determine which scenarios and time horizons to map based on risk tolerance and criticality.	Short-term
5-5	FEMA should work with other Federal agencies (ex. NOAA, USACE, USGS), the U.S. Global Change Research Program (USGCRP), and the National Ocean Council to provide a set of regional sea-level rise scenarios, based on the Parris et al, 2012 scenarios, for the coastal regions of the U.S. out to the year 2100 that can be used for future coastal flood hazard estimation.	Short-term

Recommendation 3: Provide flood hazard products and information for coastal and Great Lakes areas that include the future effects of long-term erosion and sea/lake level rise. Major elements are:

- Provide guidance and standards for the development of future conditions coastal flood hazard and risk products.
- Incorporate local relative sea/lake level rise scenarios and long-term coastal erosion into coastal flood hazard analyses.

Consider the range of potential future natural and manmade coastal changes, such as inundation and coastal erosion.

Sub-Recommendation	Timing
<p>5-7 FEMA should prepare map layers displaying the location and extent of areas subject to long-term erosion and make the information publicly available. Elements include:</p> <ul style="list-style-type: none"> • Establishing the minimum standards for long-term erosion mapping that will be used by FEMA that must be met by partners / communities if it is to be incorporated into the FEMA products. • Working with Federal, State, and local stakeholders to develop these minimum standards via pilot studies. • Securing funding that can support sustained long-term erosion monitoring and mapping by allowing for periodic updates. 	Long-term
<p>5-9 FEMA should support additional research to characterize how a changing climate will result in changes in Great Lakes and ocean wave conditions, especially along the Pacific Coast. The relative importance of waves on this coast makes this an important consideration.</p>	Long-term
<p>5-10 For the Great Lakes, the addition or subtraction of future lake level elevations associated with a changing climate is not recommended at this time due to current uncertainty in projections of future lake levels.</p>	Short-term
<p>5-11 FEMA should build upon the existing current conditions flood hazard analyses prepared by FEMA for the NFIP to determine future coastal flood hazards.</p>	Short-term
<p>5-12 FEMA should incorporate local Relative Sea Level Rise scenarios into the existing FEMA coastal flood insurance study process in one of the following ways:</p> <ul style="list-style-type: none"> • Direct Analysis – Incorporate sea level rise directly into process modeling (ex. surge, wave setup, wave runup, overtopping, and erosion) for regions where additional sea level is determined to impact the BFE non-linearly (ex. 1FT SLR = 2FT or more BFE increase). • Linear Superposition – Add sea level to the final calculated total water level and redefine base flood elevation for regions where additional sea level is determined to impact the BFE linearly (ex. 1FT SLR = 1FT BFE increase). <p>Wave effects should be calculated based on the higher Stillwater including sea level rise.</p>	Short-term

Recommendation 3: Provide flood hazard products and information for coastal and Great Lakes areas that include the future effects of long-term erosion and sea/lake level rise. Major elements are:

- Provide guidance and standards for the development of future conditions coastal flood hazard and risk products.
- Incorporate local relative sea/lake level rise scenarios and long-term coastal erosion into coastal flood hazard analyses.

Consider the range of potential future natural and manmade coastal changes, such as inundation and coastal erosion.

Sub-Recommendation	Timing
5-13 Maps displaying the location and extent of areas subject to long-term coastal erosion and future sea level rise scenarios should be advisory (non-regulatory) for Federal purposes. Individuals and jurisdictions can use the information for decision-making and regulatory purposes if they deem appropriate.	Short-term

Table 7: Recommendation 4 and Sub-Recommendations

<p>Recommendation 4: Provide future conditions flood risk products and information for riverine areas that include the impacts of: future development, land use change, erosion, and climate change, as actionable science becomes available. Major elements are:</p> <ul style="list-style-type: none"> • Provide guidance and standards for the development of future conditions riverine flood risk products. • Future land use change impacts on hydrology and hydraulics can and should be modeled with land use plans and projections, using current science and build upon existing model study methods where data are available and possible. • Future land use should assume built-out floodplain fringe and take into account the decrease of storage and increase in discharge. • No actionable science exists at the current time to address climate change impacts to watershed hydrology and hydraulics. If undertaken, interim efforts to incorporate climate change impacts in flood risk products and information should be based on existing methods, informed by historical trends, and incorporate uncertainty based upon sensitivity analyses. <p>Where sufficient data and knowledge exist, incorporate future riverine erosion (channel migration) into flood risk products and information.</p>		
Sub-Recommendation		Timing
4-7	FEMA should evaluate previously-issued guidance for future conditions land use and hydrology to incorporate best practices and lessons learned from communities that have implemented the guidance since 2001.	Short-term
4-9	FEMA should determine long-term riverine erosion hazard areas for areas subject to high erosion and provided to the public in a digital layer.	Short-term
4-10	FEMA should utilize a national standard for riverine erosion zone delineations that reflects geographic variability.	Short-term
5-6	FEMA should take the impacts of future development and land use change on future conditions hydrology into account when computing future conditions for riverine areas.	Short-term
5-8	FEMA should implement riverine erosion hazard mapping (E Zones that define channel migration zones), leveraging existing data, models, and approaches that reflect site-specific processes and conditions.	Long-term
5-15	FEMA should use observed riverine trends to help estimate what future conditions might look like. In watersheds where floods of interest may decrease in magnitude and frequency then use existing riverine study results as the basis for flood hazard mapping. In watersheds where floods exhibit increase in magnitude or frequency then use best available science to determine future hydrology and flood hazards.	Short-term
5-16	FEMA should work with other Federal agencies via the Advisory Committee on Water Information sub-committee on hydrology to produce a new method to estimate future riverine flood flow frequencies. This method should contain ways to consistently estimate future climate-impacted riverine floods and address the appropriate range of flood frequencies needed by the NFIP.	Long-term

Recommendation 4: Provide future conditions flood risk products and information for riverine areas that include the impacts of: future development, land use change, erosion, and climate change, as actionable science becomes available. Major elements are:

- Provide guidance and standards for the development of future conditions riverine flood risk products.
- Future land use change impacts on hydrology and hydraulics can and should be modeled with land use plans and projections, using current science and build upon existing model study methods where data are available and possible.
- Future land use should assume built-out floodplain fringe and take into account the decrease of storage and increase in discharge.
- No actionable science exists at the current time to address climate change impacts to watershed hydrology and hydraulics. If undertaken, interim efforts to incorporate climate change impacts in flood risk products and information should be based on existing methods, informed by historical trends, and incorporate uncertainty based upon sensitivity analyses.

Where sufficient data and knowledge exist, incorporate future riverine erosion (channel migration) into flood risk products and information.

Sub-Recommendation		Timing
5-17	FEMA should produce, and should encourage communities to adopt, future conditions products to reduce flood risk.	Short-term

Table 8: Recommendation 5 and Sub-Recommendation

Recommendation 5: Generate future conditions data and information such that it may frame and communicate flood risk messages to more accurately reflect the future hazard in ways that are meaningful to and understandable by stakeholders. This should enable users to make better-informed decisions about reducing future flood-related losses.

Sub-Recommendation		Timing
3-3	FEMA should frame future risk messages for future conditions data and information such that individuals will pay attention to the future flood risk. Messages may be tailored to different stakeholders as a function of their needs and concerns.	Long-term

Table 9: Recommendation 6 and Sub-Recommendations

Recommendation 6: Perform demonstration projects to develop future conditions data for representative coastal and riverine areas across the nation to evaluate the costs and benefits of different methodologies or identify/address methodological gaps that affect the creation of future conditions data.

Sub-Recommendation		Timing
3-1	FEMA should perform a study to quantify the accuracies, degree of precision and uncertainties associated with respect to flood studies and mapping products for existing and future conditions. This should include the costs and benefits associated with any recommendation leading to additional requirements for creating flood related products.	Short-term

Recommendation 6: Perform demonstration projects to develop future conditions data for representative coastal and riverine areas across the nation to evaluate the costs and benefits of different methodologies or identify/address methodological gaps that affect the creation of future conditions data.

Sub-Recommendation		Timing
5-3	FEMA should conduct future conditions mapping pilots to continue to refine a process and methods for mapping and calculating future flood hazards and capture and document best practices and lessons learned for each.	Short-term
5-14	FEMA should support research for future conditions coastal hazard mapping pilots and case studies using the latest published methods to determine the best means to balance the costs and benefits of increasing accuracy and decreasing uncertainty.	Short-term

Table 10: Recommendation 7 and Sub-Recommendations

Recommendation 7: Data and analysis used for future conditions flood risk information and products should be consistent with standardized data and analysis used to determine existing conditions flood risk, but also should include additional future conditions data, such as climate data, sea level rise information, long-term erosion data; and develop scenarios that consider land use plans, planned restoration projects, and planned civil works projects, as appropriate, that would impact future flood risk.

Sub-Recommendation		Timing
4-2	FEMA should support expanded research innovation for water data collection, for example using Doppler radar.	Short-term
4-3	FEMA should use a scenario approach to evaluate the impacts of future flood control projects on future conditions flood hazards.	Short-term
4-5	FEMA should support research on future conditions land use effects on future conditions hydrology and hydraulics.	Short-term
4-12	FEMA should develop guidance for evaluating locally developed data from States and communities to determine if it is an improvement over similarly-available National data sets and could be used for future condition flood hazard analyses.	Short-term
4-13	FEMA should develop better flood risk assessment tools to evaluate future risk, both population-driven and climate-driven. Improve integration of hazard and loss estimation models (such as HAZUS) with land use planning software designed to analyze and visualize development alternatives, scenarios, and potential impacts to increase use in local land use planning.	Long-term
5-1	Future flood hazard calculation and mapping methods and standards should be updated periodically as we learn more through observations and modeling of land surface and climate change, and as actionable science evolves.	Short-term

Appendix A. TMAC Charter¹

¹ The TMAC Charter inserted into this report is the renewed Charter, effective July 29, 2015. The original TMAC Charter was effective July 29, 2013

**Department of Homeland Security
Federal Emergency Management Agency
Technical Mapping Advisory Council**

1. Committee’s Official Designation:

Technical Mapping Advisory Council

2. Authority:

Pursuant to section 100215 of the Biggert-Waters Flood Insurance Reform Act of 2012, Public Law 112-141, 126 Stat. 924, 42 U.S.C. § 4101a (“the Act”), this charter establishes the Technical Mapping Advisory Council (TMAC or Council). This committee is established in accordance with and operates under the provisions of the *Federal Advisory Committee Act* (FACA) (Title 5, United States Code, Appendix).

3. Objectives and Scope of Activities:

The TMAC advises the Administrator of the Federal Emergency Management Agency (FEMA) on certain aspects of FEMA’s flood risk mapping activities.

The TMAC recommends to the Administrator:

- A. How to improve in a cost-effective manner the:
 - 1. Accuracy, general quality, ease of use, and distribution and dissemination of flood insurance rate maps and risk data; and
 - 2. Performance metrics and milestones required to effectively and efficiently map flood risk areas in the United States.
- B. Mapping standards and guidelines for:
 - 1. Flood Insurance Rate Maps (FIRMs); and
 - 2. Data accuracy, data quality, data currency, and data eligibility;
- C. How to maintain, on an ongoing basis, FIRMs and flood risk identification; and
- D. Procedures for delegating mapping activities to State and local mapping partners.

The TMAC recommends to the Administrator and other Federal agencies participating in the Council:

- A. Methods for improving interagency and intergovernmental coordination on flood mapping and flood risk determination; and
- B. A funding strategy to leverage and coordinate budgets and expenditures across Federal agencies.

The TMAC submits an annual report to the Administrator that contains a description of the activities of the Council, an evaluation of the status and performance of FIRMs and mapping activities to revise and update FIRMs as required by the Act, and a summary of the activities of the Council. In addition, the TMAC must prepare written recommendations in a future conditions risk assessment and modeling report and submit the recommendations to the Administrator. Further, the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 requires additional flood mapping review requirements for the TMAC.

4. Description of Duties:

The duties of the TMAC are solely advisory in nature.

5. Official to Whom the Committee Reports:

The TMAC provides advice and recommendations to the Administrator of FEMA.

6. Support:

FEMA shall be responsible for providing financial and administrative support to the Council. Within FEMA, the Risk Analysis Division of the Federal Insurance and Mitigation Administration provides this support.

7. Estimated Annual Operating Costs and Staff Years:

The estimated annual operating cost associated with supporting TMAC's functions is estimated to be \$1,100,000 for FY2015 and \$800,000 for FY2016. This includes surge support for all direct and indirect expenses and 2.0 FTE of staff support. Adequate staffing within the annual operating cost estimate is required to support the TMAC.

8. Designated Federal Officer:

A full-time or permanent part-time employee of FEMA is appointed by the Administrator as the TMAC Designated Federal Officer (DFO). The DFO or an Alternate DFO approves or calls TMAC meetings, approves meeting agendas, attends all committee and subcommittee meetings, adjourns any meeting when the DFO determines adjournment to be in the public interest, and chairs meetings when requested in the absence of the Chair.

9. Estimated Number and Frequency of Meetings:

Meetings of the TMAC may be held with the approval of the DFO. The Council shall meet a minimum of two times each year at the request of the Chairperson or a majority of its members, and may take action by a vote of the majority of the members.

Council meetings are open to the public unless a determination is made by the appropriate DHS official in accordance with DHS policy and directives that the meeting should be closed in accordance with Title 5, United States Code, subsection (c) of section 552b.

10. Duration:

Continuing

11. Termination:

This charter is in effect for two years from the date it is filed with Congress unless sooner terminated. The charter may be renewed at the end of this two-year period in accordance with section 14 of FACA.

12. Member Composition:

Members of the Council are defined by Section 100215(b)(1), and include four designated members and sixteen appointed members.

The four designated members of the Council serve as Regular Government Employees and consist of:

- The FEMA Administrator or the designee thereof;
- The Secretary of the Interior or the designee thereof;
- The Secretary of Agriculture or the designee thereof; and

The Under Secretary of Commerce for Oceans and Atmosphere or the designee thereof.

The sixteen additional members of the Council are appointed by the Administrator or designee. These members are appointed based on their demonstrated knowledge and competence regarding surveying, cartography, remote sensing, geographic information systems, or the technical aspects of preparing and using FIRMs.

To the maximum extent practicable, the membership of the Council will have a balance of Federal, State, local, tribal and private members, and include geographic diversity including representation from areas with coastline on the Gulf of Mexico and other States containing areas identified by the Administrator as at high risk for flooding or as areas having special flood hazard areas.

These members are selected from among the following professional associations or organizations:

- a. One member of a recognized professional surveying association or organization;
- b. One member of a recognized professional mapping association or organization;
- c. One member of a recognized professional engineering association or organization;
- d. One member of a recognized professional association or organization representing flood hazard determination firms;
- e. One representative of the United States Geological Survey;
- f. One representative of a recognized professional association or organization representing State geographic information;
- g. One representative of State national flood insurance coordination offices;
- h. One representative of the Corps of Engineers;
- i. One member of a recognized regional flood and storm water management organization;
- j. Two representatives of different State government agencies that have entered into cooperating technical partnerships with the Administrator and have demonstrated the capability to produce FIRMs;
- k. Two representatives of different local government agencies that have entered into cooperating technical partnerships with the Administrator and have demonstrated the capability to produce flood insurance maps;
- l. One member of a recognized floodplain management association or organization;
- m. One member of a recognized risk management association or organization; and
- n. One State mitigation officer.

The non-Federal members in a., b., c., d., i., l., m., and n. serve as Special Government Employees as defined in Title 18, United States Code, section 202(a). The members in e., and h., serve as Regular Government Employees. The non-Federal members in f., g., j., and k. serve as representatives of their respective associations or organizations and are not Special Government Employees as defined in Title 18 of United States Code, section 202(a).

The sixteen appointed members serve terms of office of two years. However, up to half (eight) of those initially appointed to the Council may serve one-year terms to allow for staggered turnover. Appointments may be renewed by the FEMA Administrator for an additional one- or two-year period. A member appointed to fill an unexpired term shall serve the remainder of that term and may be reappointed for an additional one- or two-year term. The Administrator has the authority to extend reappoints for an additional one- or two-year period as deemed necessary. In the event the Council terminates, all appointments to the Council will terminate.

13. Officers:

The Council membership shall elect any one member to serve as Chairperson of the Council. The Chairperson shall preside over Council meetings in addition to specific responsibilities authorized under the Act.

14. Subcommittees:

The DFO may establish subcommittees for any purpose consistent with this charter. Such subcommittees may not work independently of the chartered committee and must present their work to the TMAC for full deliberation and discussion. Subcommittees have no authority to make decisions on behalf of the TMAC and may not report directly to the Federal government or any other entity.

15. Recordkeeping:

The records of the TMAC, formally and informally established subcommittees, or other subgroups of the Council, shall be maintained and handled in accordance with General Records Schedule 26, Item 2 or other approved agency records disposition schedule.

16. Filing Date:

July 20, 2015
Department Approval Date

July 29, 2015
CMS Consultation Date

July 29, 2015
Date Filed with Congress

Appendix B. FEMA TMAC Bylaws²

² The TMAC Bylaws inserted into this report are the updated By-laws, effective April 29, 2015. The original TMAC By-laws were effective July 29, 2013

**Federal Emergency Management Agency
Technical Mapping Advisory Council
Bylaws**

ARTICLE I AUTHORITY

As required by the *Biggert-Waters Flood Insurance Reform Act of 2012* (BW-12), codified at 42 United States Code Section 4101a, the Federal Emergency Management Agency (FEMA) Technical Mapping Advisory Council (TMAC) is established. The TMAC shall operate in accordance with the provisions of the *Federal Advisory Committee Act* (FACA), as amended (Title 5, U.S.C., Appendix).

ARTICLE II PURPOSE

The TMAC provides advice and recommendations to the Administrator of FEMA to improve the preparation of flood insurance rate maps (FIRM). Among its specified statutory responsibilities, TMAC will examine performance metrics, standards and guidelines, map maintenance, delegation of mapping activities to State and local mapping partners, interagency coordination and leveraging, and other requirements mandated by the authorizing BW-12 legislation. In addition, TMAC provides advice and recommendations to the FEMA Administrator on future risks from climate change, rising sea levels, and FIRM development, as mandated by BW-12. Further, the Homeowner Flood Insurance Affordability Act (HFIAA) of 2014 requires additional flood mapping review requirements for the TMAC.

ARTICLE III MEMBERSHIP AND MEMBER RESPONSIBILITIES

Section 1. Composition.

Members of the Council include designated members and additional members appointed by the FEMA Administrator or his designee. See 42 U.S.C. § 4101a.

The designated members of the Council are:

- The FEMA Administrator or the designee thereof;
- The Secretary of the Interior or the designee thereof;
- The Secretary of Agriculture or the designee thereof; and,
- The Under Secretary of Commerce for Oceans and Atmosphere or the designee thereof.

The appointed members may be selected from among the following professional associations or organizations:

- A member of a recognized professional surveying association or organization;
- A member of a recognized professional mapping association or organization;

- A member of a recognized professional engineering association or organization;
- A member of a recognized professional association or organization representing flood hazard determination firms;
- A representative of the United States Geological Survey;
- A representative of a recognized professional association or organization representing State geographic information;
- A representative of State national flood insurance coordination offices;
- A representative of the Corps of Engineers;
- A member of a recognized regional flood and storm water management organization;
- Two representatives of different State government agencies that have entered into cooperating technical partnerships with the Administrator and have demonstrated the capability to produce FIRMs;
- Two representatives of different local government agencies that have entered into cooperating technical partnerships with the Administrator and have demonstrated the capability to produce flood insurance maps;
- A member of a recognized floodplain management association or organization;
- A member of a recognized risk management association or organization;
- A State mitigation officer.

Subject Matter Experts/Technical Advisors: The TMAC may hear from subject matter experts/technical advisors (“SMEs”) who will be asked to provide specialized information or assistance as appropriate and approved by the Designated Federal Officer (DFO). Individual TMAC members may request SMEs, by expertise or skillset, to appear before the TMAC, as needed. Member requests will be made to the Chair for consideration and consultation with the TMAC Designated Federal Officer (DFO). FEMA will not compensate SMEs for their services but they may be reimbursed for travel and lodging expenses.

Section 2. Appointment.

With the exception of the Secretary of the Interior, Secretary of Agriculture, and Under Secretary of Commerce for Oceans and Atmosphere, members of TMAC are appointed by and serve at the pleasure of the FEMA Administrator in an advisory role. Membership is voluntary and members are not compensated for their services. Appointments are personal to the member and cannot be transferred to another individual. Members may not designate someone to attend in their stead, participate in discussions, or vote. In compliance with FACA, members, while engaged in the performance of their duties away from their home or regular places of business, may be allowed travel expenses, including per diem in lieu of subsistence, as authorized by section 5703 of title 5, United States Code.

Section 3. Terms of Office.

Members of the TMAC may serve terms of office of two years; however, up to half of those initially appointed TMAC members may be appointed to serve one-year terms to allow for staggered turnover. The FEMA Administrator or his designee may reappoint serving members for additional terms. When the TMAC terminates, all appointments to the TMAC shall terminate.

Section 4. Certification of Non-Lobbyist Status.

All members of the TMAC must annually self-certify that they are not registered lobbyists under the *Lobbying Disclosure Act*, Title 2 U.S.C., Section 1603, and must advise the Department of Homeland Security (DHS) through the Federal Emergency Management Agency if they register as a lobbyist while serving on the TMAC. Members who register as a lobbyist after their appointment or re-appointment will be replaced on the Council.

Section 5. Members' Responsibilities.

Because the TMAC's membership is constructed to balance as many perspectives on floodplain mapping and future risk assessment as possible, member attendance and participation at meetings is vital to the TMAC's mission. Members are expected to personally attend and participate in Council, subcommittee meetings, and conference calls. Members will also be expected to provide written input to any final reports or deliverables.

The DFO or Chair may recommend to the FEMA Administrator that any appointed member unable to fulfill their responsibility be replaced on the Council or subcommittee. Members of the TMAC may be recommended for removal for reasons such as, but not limited to:

- a) Missing two consecutive meetings, including teleconference calls;
- b) Registering as a lobbyist after appointment; or,
- c) Engaging in activities that are illegal or violate the restrictions on members' activities as outlined below.

Section 6. Restriction on Members' Activities.

- a) Members may not use their access to the Federal Government as a member of this Council for the purpose of soliciting business or otherwise seeking economic advantage for themselves or their companies. Members may not use any non-public information obtained in the course of their duties as a member for personal gain or for that of their company or employer. Members must hold any non-public information in confidence.
- b) The Council as a whole may advise FEMA on legislation or recommend legislative action. In their capacities as members of the TMAC, individual

members may not petition or lobby Congress for or against particular legislation or encourage others to do so.

- c) Members of the TMAC are advisors to the agency and have no authority to speak for the Council, FEMA, or for the Department outside the Council structure.
- d) Members may not testify before Congress in their capacity as a member of the TMAC. If requested to testify before Congress, members of the TMAC:
 - 1. Cannot represent or speak for the Council, DHS, any agency, or the Administration in their testimony;
 - 2. Cannot provide information or comment on Council recommendations that are not yet publicly available;
 - 3. May state they are a member of the Council; and,
 - 4. May speak to their personal observations as to their service on the Council.
- e) If speaking outside the Council structure at other forums or meetings, the restrictions in Section (d) also apply.

ARTICLE IV OFFICIALS

Section 1. TMAC Leadership.

TMAC members will elect a Chair through a nomination and formal vote. (The FEMA Administrator, or his designee, shall serve in this capacity until a Chair is elected.) The Chair will be responsible for appointing one or more Vice Chairs. The Chair and Vice Chairs will serve for either a one or two year term, based on their initial appointment. Appointments may be renewed for an additional one-year term. No Chair or Vice Chair shall serve longer than three years. The Chair will select chairs for any subcommittee established. Only voting members can serve as subcommittee chairs.

Chair Responsibilities:

- a. Appoints officers to assist in carrying out the duties of the TMAC;
- b. Works with the DFO to develop meeting agendas;
- c. Sets and maintains a schedule for TMAC activities (e.g., report development);
- d. Works with the TMAC membership to develop the draft annual report;
- e. Signs the final reports addressed to the FEMA Administrator;
- f. Coordinates with the DFO to form subcommittees with assigned areas of consideration;
- g. Selects subcommittee chairs and vice chairs;
- h. Resolves member conflicts.

Vice Chair Responsibilities:

- a. Works with subcommittee chairs to ensure work is being completed;
- b. Coordinates member engagement;
- c. Assists Chair in conducting review of meeting minutes and recommendation reports;
- d. Elevates any unresolved issues to the Chair;
- e. Serves as Chair in absence of the Chair.

Subcommittee Chair Responsibilities:

- a. Works with the DFO to develop subcommittee meeting agendas;
- b. Facilitates subcommittee discussions;
- c. Reports to the Chair and Vice Chair; and
- d. Reports out subcommittee work at quarterly TMAC meetings.

Section 2. Designated Federal Officer.

The DFO serves as FEMA's agent for all matters related to the TMAC and is appointed by the FEMA Administrator. In accordance with the provisions of the FACA, the DFO must:

- a. Approve or call meetings of the Council and its subcommittees;
- b. Approve agendas for Council and subcommittee meetings;
- c. Attend all meetings;
- d. Adjourn meetings when such adjournment is in the public interest; and,
- e. Chair meetings of the Council when directed to do so by the FEMA Administrator.

In addition, the DFO is responsible for assuring administrative support functions are performed, including the following:

- a. Notifying members of the time and place of each meeting;
- b. Tracking all recommendations of the Council;
- c. Maintaining the record of members' attendance;
- d. Preparing the minutes of all meetings of the Council's deliberations, including subcommittee and working group activities;
- e. Attending to official correspondence;
- f. Maintaining official records and filing all papers and submissions prepared for or by the Council, including those items generated by subcommittees and working groups;
- g. Reviewing and updating information on Council activities in the Shared Management System (i.e., FACA database) on a monthly basis;

- h. Acting as the Council’s agent to collect, validate and pay all vouchers for pre-approved expenditures; and
- i. Preparing and handling all reports, including the annual report as required by FACA.

ARTICLE V MEETING PROCEDURES

Section 1. Meeting Schedule and Call of Meetings.

TMAC will meet in plenary sessions approximately once or twice per quarter, with additional virtual meetings as needed, at the discretion of the DFO. The Council may hold hearings, receive evidence and assistance, provide information, and conduct research, as it considers appropriate, subject to resources being made available. With respect to the meetings, it is anticipated that some may be held via teleconference, with public call-in lines. TMAC meetings will be open to the public unless a determination is made by the appropriate FEMA official that the meeting should be closed in accordance with subsection (c) of section 552b of title 5, U.S.C.

Section 2. Agenda.

Meeting agendas are developed by the DFO in coordination with the TMAC chair. In accordance with the responsibilities under FACA, the DFO approves the agenda for all Council and subcommittee meetings, distributes the agenda to members prior to the meeting, and publishes the agenda in the Federal Register.

FEMA will publish the meeting notice and agenda in the Federal Register at least 15 calendar days prior to each TMAC meeting or official public conference call. Once published in the Federal Register, the agenda items cannot be changed prior to or during a meeting.

Section 3. Quorum.

A quorum of the TMAC is the presence of fifty percent plus one of the Council members currently appointed. In the event a quorum is not present, the TMAC may conduct business that does not require a vote or decision among members. Votes will be deferred until such time as a quorum is present.

Section 4. Voting Procedures.

When a decision or recommendation of the TMAC is required, the Chair will request a motion for a vote. A motion is considered to have been adopted if agreed to by a simple majority of a quorum of TMAC members. Members vote on draft reports and recommendations in open meetings through a resolution recorded in the meeting minutes. Only members present at the meeting—either in

person or by teleconference—may vote on an item under consideration. No proxy votes or votes by email will be allowed.

Section 5. Minutes.

The DFO will prepare the minutes of each meeting and distribute copies to each Council member. Minutes of open meetings will be available to the public on the TMAC website at <http://www.fema.gov/TMAC>. The minutes will include a record of:

- a. The time, date, and place of the meeting;
- b. A list of all attendees including Council members, staff, agency employees and members of the public who presented or oral or written statements;
- c. An accurate description of each matter discussed and the resolution, if any, made by the Council;
- d. Copies of reports or other documents received, issued, or approved by the Council; and
- e. An accurate description of public participation, including oral and written statements provided.

The DFO ensures that the Chair certifies the minutes within 90 calendar days of the meeting to which they relate and prior to the next TMAC meeting.

Minutes of closed meetings will also be available to the public upon request subject to the withholding of matters about which public disclosure would be harmful to the interests of the Government, industry, or others, and which are exempt from disclosure under the *Freedom of Information Act* (FOIA) (5 U.S.C., section 552).

Section 6. Open Meetings.

TMAC meetings shall be open and announced to the public in a notice published in the Federal Register at least fifteen calendar days before the meeting. Members of the public may attend any meeting or portion of a meeting that is not closed to the public and, at the determination of the Chair and DFO, may offer oral comment at such meeting. Meetings will include a period for oral comments unless it is clearly inappropriate to do so. Members of the public may submit written statements to the TMAC at any time. All materials provided to the Council shall be available to the public when they are provided to the members. Such materials, including any submissions by members of the public, are part of the meeting record.

Section 7. Closed Meetings.

All or parts of TMAC meetings may be closed in limited circumstances and in accordance with applicable law. No meeting may be partially or fully closed

unless the component head issues a written determination that there is justification for closure under the provisions of subsection (c) of 5 United States Code 552b, the *Government in the Sunshine Act*. Where the DFO has determined in advance that discussions during a Council meeting will involve matters about which public disclosure would be harmful to the interests of the government, industry, or others, an advance notice of a closed meeting, citing the applicable exemptions of the *Government in the Sunshine Act*, will be published in the Federal Register.

The notice may announce the closing of all or just part of a meeting. If, during the course of an open meeting, matters inappropriate for public disclosure arise during discussions, the DFO or Chair will order such discussion to cease and will schedule it for a future meeting of the Council that will be approved for closure. No meeting or portion of a meeting may be closed without prior approval and notice published in the Federal Register at least 15 calendar days in advance. Closed meetings can only be attended by DFO, Council members, and necessary agency staff members. Presenters must leave immediately after giving their presentations and answering any questions.

Section 8. Other Meetings, No Public Notice Required.

Public notice is not required for meetings of administrative or preparatory work. Administrative work is a meeting of two or more TMAC or subcommittee members convened solely to discuss administrative matters or to receive administrative information from a Federal officer or agency. Preparatory work is a meeting of two or more TMAC or subcommittee members convened solely to gather information, conduct research, or analyze relevant issues and facts in preparation for a TMAC meeting or to draft position papers for consideration by the TMAC.

ARTICLE VI EXPENSES AND REIMBURSEMENTS

Expenses related to the operation of the TMAC will be paid by the Federal Insurance and Mitigation Administration. Expenditures of any kind must be approved in advance by the DFO. All such expense reports will be sent to the DFO for action and reimbursement. The DFO will be responsible for handling the payment of expenses. Members are responsible for submitting expense reports by the deadlines set by the DFO or they may not be reimbursed. The DFO will be responsible for developing the procedures for expense reimbursement.

ARTICLE VII ADMINISTRATION

The Federal Insurance and Mitigation Administration shall be responsible for providing financial and administrative support to the TMAC subject to the availability of appropriations.

ARTICLE VIII SUBCOMMITTEES

Section 1. Establishment of subcommittees.

The DFO may establish standing subcommittees with an overarching mission to work on specific focus areas and provide advice to the TMAC on a continuing basis. The DFO may also establish ad-hoc subcommittees to work and report on specific focus areas. The number, designation, mission, scope, and membership of subcommittees are determined by the DFO in consultation with the Chair and Vice Chairs. The Chair may also request of the DFO to establish (or reorganize) a subcommittee. The creation and operation of the subcommittees must be approved by the DFO on behalf of FEMA.

Subcommittee Members: TMAC subcommittees may consist of TMAC members and non-TMAC members as limited below. TMAC members will be named to serve on a specific subcommittee and may contribute to others as requested. It is mandatory that each TMAC member participate on at least one subcommittee and be a full and active participant in subcommittee deliberations.

Subcommittees will not function independently of the TMAC or provide advice or recommendations directly to FEMA. Subcommittees (standing and ad-hoc) must present all advice, recommendations, and reports to the full TMAC during a public meeting or teleconference for discussion, deliberation, and final approval. Each Subcommittee must be comprised of a majority of TMAC members.

In general, the requirements of FACA do not apply to subcommittees of advisory committees that report a parent advisory committee and not directly to a Federal officer or agency. However, minutes must be maintained for the public record and the DFO and/or ADFO must participate in all subcommittee proceedings.

Section 2. Membership.

Subcommittee membership should be balanced in relation to the subcommittee's mission and focus areas. The DFO and the Chair, with input from Council members, identify and determine the membership for the subcommittee, including a chair (and vice chair if deemed necessary). As noted above, each Subcommittee must be comprised of a majority of TMAC members.

Subcommittee chairs may request the DFO to invite non-TMAC individuals to serve on the subcommittee, as necessary. Only TMAC members may serve as the chair or vice chair of a subcommittee (standing or ad-hoc). The subcommittee chair can also advise the DFO that briefings from external subject matter experts are needed to provide pertinent and vital information not available among the current TMAC membership or from Federal staff. All such requests shall be made to the DFO who will facilitate the process to obtain subject matter expertise.

Section 3 Subcommittee Quorum

A Subcommittee quorum consists of: (1) the presence (either in person or by teleconference) of fifty percent plus one of TMAC members currently appointed to the Subcommittee; and (2) TMAC members make up more than half of the Subcommittee members present. In the event a Subcommittee quorum is not present, the Subcommittee may conduct business that does not require a vote or decision among members. Votes will be deferred until such time as a quorum is present.

Section 4 Subcommittee Voting Procedures

When a decision or recommendation of the Subcommittee is required, and a Subcommittee Quorum as defined above is present, the Subcommittee Chair will request a motion for a vote. A motion is considered to have been adopted if agreed to by a simple majority of the TMAC Subcommittee members present. Members vote on draft reports and recommendations that will be presented to the full TMAC. Only members present at the meeting—either in person or by teleconference—may vote on an item under consideration. No proxy votes or votes by email will be allowed.

Section 5. Focus Areas

Focus Areas are identified areas of consideration for the Council to review, either via subcommittee or by the TMAC through discussion as an entire body. The DFO will determine focus areas in consultation with the TMAC Chair. The DFO will then work with the Chair and Vice Chair to identify whether the focus area should be assigned to a standing subcommittee, an ad hoc subcommittee; or submitted to the TMAC for discussion and review.

Section 6. Workload and meetings.

Subcommittees may have more than one focus area to address. Subcommittee chairs will recommend the appropriate number of conference calls necessary to address focus areas, working in coordination with the DFO.

The subcommittee chair determines what materials are needed to prepare a response and develop a report to the TMAC. The DFO will supply the requested materials to the TMAC subcommittee upon request and resource availability.

ARTICLE IX RECOMMENDATIONS AND REPORTING

P.L. 112-141 directs TMAC to submit an annual report to the Administrator that contains a description of the activities of the Council; an evaluation of the status and performance of flood insurance rate maps and mapping activities to revise and update flood insurance rate maps; and a summary of recommendations made by the Council to the Administrator.


Once the TMAC achieves consensus on a report and recommendations, the TMAC Chair is responsible for providing a final version of the report to the FEMA Administrator. The final report and any accompanying memoranda will be posted on the TMAC website.

ARTICLE X RECORDKEEPING

The DFO maintains all records of the advisory Council in accordance with FACA and FEMA policies and procedures. All documents, reports, or other materials presented to, or prepared by or for the Council, constitute official government records and are available to the public upon request.

ARTICLE XI BYLAWS APPROVAL AND AMENDMENTS

The DFO may amend these bylaws at any time, and the amendments shall become effective immediately upon approval.



Mark Crowell
Designated Federal Officer

Date approved: 4/29/15

Appendix C. 2014-2015 TMAC Meetings

Table 11: 2014-2015 TMAC Meetings

Meeting Date	Location	Business Purpose
September 10, 2014	Virtual (closed to the public)	The TMAC conducted an administrative meeting to kick off future efforts by informing the TMAC members of requirements under authorizing legislation, member roles and responsibilities, legal and ethical statutes governing member activities, and next steps for the first in-person meeting.
September 30-October 1, 2014	USGS, Reston, Virginia	The TMAC voted, elected, and announced their Chair, Mr. John Dorman. TMAC members also discussed legislative requirements and received subject matter expert (SME) briefings that helped establish the TMAC's baseline understanding of the current status of the mapping program.
December 4-5, 2014	FEMA, Arlington, Virginia	The TMAC deliberated and voted upon its vision, mission and guiding principles and received SME briefings such as overall flood management process and components, data acquisition, maintenance, and dissemination, and future conditions risk to insurance rating.
March 10-11, 2015	USGS, Reston, Virginia	The TMAC deliberated and voted upon topics to be included in the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> . TMAC members also received SME briefings such as how FEMA uses flood risk to calculate insurance ratings, floodplain management and the Flood Insurance Advocate, and state and local cooperating technical partner methods.
May 12-13, 2015	USGS, Reston, Virginia	The TMAC deliberated and voted to adopt outlines / table of contents for the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> .
June 23-24, 2015	NOAA, Silver Spring, Maryland	The TMAC deliberated and voted upon the annotated outlines for the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> . TMAC members also received SME briefings such as progress on the FEMA Flood Insurance Reform Flood Mapping Integrated Project Team and a tribal perspective.
August 4-5, 2015	USGS, Reston, Virginia	The TMAC deliberated on draft recommendations and narratives for potential infusion in the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> .
September 9, 2015	Virtual	The TMAC reviewed, commented, and deliberated on draft recommendations and narratives for incorporation into the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> .
September 29, 2015	Virtual	The TMAC reviewed, commented, and deliberated draft recommendations and narratives for incorporation into the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> .
October 20-21, 2015	USGS, Reston, Virginia	The TMAC reviewed, commented, and deliberated draft recommendations and narratives for incorporation into the 2015 <i>Annual Report</i> and the <i>Future Conditions Report</i> .

Appendix D. Future Conditions Subcommittee Meetings

Table 12: Future Conditions Subcommittee Meetings

Meeting Date	Business Purpose
January 20, 2015	To discuss the legislative background, schedules, and requirements of the future conditions report
February 13, 2015	To determine the SME briefings required and schedule
February 27, 2015	To receive SME briefings on the United States Army Corps of Engineers' (USACE) Perspective, guidance, and policies on SLR (sea level rise) and how they inform USACE's approaches and activities; proof on concept studies of SLR and floodplain mapping, and; the goals of the FEMA West Coast SLR pilot study.
March 10-11, 2015	To review the table of contents and assignments
March 20, 2015	To receive SME briefings on the effects of climate change on riverine hydrology
March 26, 2015	To review the table of contents and assignments
April 3, 2015	To receive SME briefings on the uncertainties and risks of regional sea-level change
April 6, 2015	To discuss draft report outline
April 23, 2015	To review feedback on the TOC
May 28, 2015	To provide an update on progress and recent changes
August 19, 2015	To discuss the subcommittee's draft recommendations
August 24, 2015	To discuss the subcommittee's draft recommendations
September 28, 2015	To discuss the draft report

Appendix E. Subject Matter Expert Presentations

Table 13: Subject Matter Expert Presentations

Date	Presenter	Presented to	Title
September 30, 2014	Mr. David Bascom Program Specialist, Risk Analysis Division, FEMA	TMAC	TMAC Priorities, Duties, and Reports
September 30, 2014	Mr. Joshua Smith Program Specialist, Business Analysis Branch, FEMA Ms. Kelly Bronowicz Program Specialist, Data and Dissemination Management Branch, FEMA Mr. Luis Rodriguez, P.E. Branch Chief, Engineering Management Branch, Federal Insurance and Mitigation Administration, FEMA	TMAC	Performance Metrics and Milestones Required to Effectively and Efficiently Map Flood Risk Areas
September 30, 2014	Mr. Michael Godesky Physical Scientist, FEMA	TMAC	FIRM Accuracy, Quality, Ease of Use, Distribution, and Dissemination
September 30, 2014	Mr. Paul Rooney Mapping Technology Specialist, FEMA	TMAC	Data Accuracy, Data Quality, Data Currency, and Data Eligibility
October 1, 2014	Mr. Mark Crowell Physical Scientist, FEMA Mr. Andy Neal Actuary, Risk Insurance Division, FEMA Ms. Rachel Sears Senior Policy Advisor, FEMA	TMAC	Future Conditions Risk Assessment and Modeling
October 1, 2014	Mr. Rick Sacbbit, P.E. Program Specialist, FEMA	TMAC	Maintaining, on an Ongoing Basis, Flood Insurance Rate Maps and Flood Risk Identification

Date	Presenter	Presented to	Title
October 1, 2014	Ms. Laura Algeo, P.E., CFM Senior Civil Engineer, FEMA Region IV	TMAC	Delegating Mapping Activities to State and Local Mapping Partners
December 4, 2014	Mr. Andy Read, CFM, EIT Program Specialist, FEMA	TMAC	Risk MAP: Flood Map Production
December 4, 2014	Ms. Vicki Lukas Chief, Topographic Data Services, USGS	TMAC	Data Acquisitions; Maintenance and Dissemination
December 4, 2014	Mr. Amar Nayegandhi, CP, CMS (RS), GISP Director of Remote Sensing, Dewberry	TMAC	Data Acquisitions; Maintenance and Dissemination
December 4, 2014	Mr. Jerad Bales Chief Scientist for Water, USGS	TMAC	Information for Understanding Current and Future Streamflow Conditions
December 4, 2014	Mr. Douglas Marcy Coastal Hazards Specialist, National Oceanic and Atmospheric Administration Mr. Steve Gill Chief Scientist, Center for Operational Products and Services, NOAA Mr. Adam Parris Division Chief, Climate Assessment and Services Division, NOAA	TMAC	NOAA Sea Level Change Measurement and Future Sea Level Rise Scenarios
December 4, 2014	Mr. Paul Kovacs Executive Director, Institute for Catastrophic Loss Reduction, Western University	TMAC	Risk to Insurance Rating

Date	Presenter	Presented to	Title
December 4, 2014	Mr. Richard Fogleman Technical Director, Geographic Information Systems, AECOM	TMAC	Database, Mapping, and Digital Display
December 4, 2014	Mr. Eric Berman, GISP Hazus Program Manager, FEMA	TMAC	Risk Assessment and Mapping
December 4, 2014	Mr. David Key, PE, CFM Director, Water Resources, GIS and Applications ESP Associates, P.A.	TMAC	Risk Assessment Processes
December 4, 2014	Ms. Tucker Mahoney Coastal Program Specialist, FEMA	TMAC	Key Decision Points
December 5, 2014	Dr. Ty Wamsley Division Chief, Flood & Storm Protection Division, US Army Engineer Research & Development Center, Coastal & Hydraulics Laboratory, ERDC	TMAC	USACE R&D: Development of Tools for the Future of Flood Inundation Prediction
December 5, 2014	Ms. Erin Cobb, CFM Program Specialist, FEMA	TMAC	Current and Future Possibilities: Delegation
December 5, 2014	Mr. Chad Berginnis Executive Director, Association of State Floodplain Managers (ASFPM)	TMAC	Current and Future Possibilities: Delegation
December 5, 2014	Ms. Sally Ann McConkey, P.E., CFM, D. WRE Illinois State Water Survey Prairie Research Institute, University of Illinois	TMAC	Examples of Next Generation Flood Risk Management

Date	Presenter	Presented to	Title
December 5, 2014	Ms. Carrie Grassi Deputy Director for Planning, New York City Mayor's Office of Recovery and Resiliency	TMAC	New York City Resiliency Briefing
December 5, 2014	Mr. Ken Ashe, P.E., PMP, CFM Assistant Director, North Carolina Floodplain Mapping Program	TMAC	Examples of Next Generation Flood Risk Management
February 27, 2015	Mr. Ed Curtis, P.E., CFM FEMA Region IX Mr. Darryl Hatheway, CFM Baker AECOM	Future Conditions Subcommittee	FEMA West Coast Sea Level Rise Pilot Study
February 27, 2015	Ms. Heidi Moritz, P.E. Coastal Engineer, Climate Preparedness and Resilience Community of Practice, USACE	Future Conditions Subcommittee	Tiered Approach to the Assessment of Sea Level Change at USACE Projects and the Development of Adaptation Measures for the Future
February 27, 2015	Dr. Brian K. Batten, CFM Senior Coastal Scientist/ Project Manager, Coastal and Resiliency Services, Dewberry	Future Conditions Subcommittee	Case Studies of SLR and Floodplain Mapping
March 3, 2015	Mr. Jonathan Westcott, P.E. Coastal Hazards Specialist, Federal Emergency Management Agency	Flood Hazard Subcommittee Operations, Coordination and Leveraging Subcommittee	NFIP Coastal Analyses and Mapping Overview for the TMAC Subcommittee Meeting
March 10, 2015	Mr. Andy Neal Actuary, Risk Insurance Division, FEMA	TMAC	Flood Risk to Insurance Rating
March 10, 2015	Mr. David Stearrett Interim Flood Insurance Advocate, FEMA	TMAC	Floodplain Management and the Federal Flood Risk Management Standard

Date	Presenter	Presented to	Title
March 10, 2015	Mr. Michael Talbott, P.E., D.WRE Executive Director, Harris County Flood Control District	TMAC	Cooperating Technical Partners (CTP) Presentation
March 10, 2015	Ms. Leslie Durham, P.E. Floodplain Management Branch Chief, Office of Water Resources, Alabama Department of Economic and Community Affairs	TMAC	National Flood Mapping Program: A State CTP Perspective
March 10, 2015	Mr. David Mallory, P.E., CFM Program Manager, Floodplain Management Program, Urban Drainage and Flood Control District, Denver, CO	TMAC	Cooperating Technical Partnership Presentation, UDFCD
March 20, 2015	Dr. Timothy Cohn Hydrologist, USGS Office of Surface Water	Future Conditions Subcommittee	Effects of Climate Change on Riverine Hydrology
March 20, 2015	Dr. Martyn Clark Scientist III, Hydrometeorological Applications Program at the National Center for Atmospheric Research (NCAR)	Future Conditions Subcommittee	Effects of Climate Change on Riverine Hydrology
March 26, 2015	Dr. Philip Orton Research Assistant Professor, Stevens Institute of Technology	Future Conditions Subcommittee	Hydrodynamic Modeling of Future Coastal Flood Hazards for New York City
April 3, 2015	Dr. Robert Kopp Earth System Science & Policy Research Group, Rutgers University	Future Conditions Subcommittee	Uncertainties and risks of regional sea-level change

Date	Presenter	Presented to	Title
April 8, 2015	Mr. Stephen R. Kalaf, CFM Special Mapping and Quality Services Department Manager, Dewberry LLC	Annual Report Subcommittee	Quality Management in Risk MAP
April 27, 2015	Mr. Michael Bremer, CFM NFDA Director, Technical Mapping Committee Chair, Director of Operations CoreLogic Flood Services	Annual Report Subcommittee	Use of FEMA Flood Map Data to Make Flood Determinations
April 27, 2015	Mr. Jason Stoker Physical Scientist and Elevation Products and Services Manager, USGS National Geospatial Program	Annual Report Subcommittee	LIDAR Technology
May 12, 2015	Mr. Paul Rooney Program Specialist, FEMA	TMAC	Database-Driven/ All Digital Display – Status/ Transition
May 12, 2015	Mr. Michael Bremer, CFM NFDA Director, Technical Mapping Committee Chair, Director of Operations CoreLogic Flood Services	TMAC	Lending and Insurance Perspective
May 13, 2015	Mr. Michael DePue, P.E., CFM Principal Technical Professional, STARR II, Atkins Global	TMAC	Map Generation: Workflow Process
June 23, 2015	Ms. March Runner Tribal Administrator, Louden Tribal Council	TMAC	Tribal Perspective

Date	Presenter	Presented to	Title
June 23, 2015	Mr. David Bascom Program Specialist, FEMA Mr. Paul Rooney Program Specialist, FEMA	TMAC	FEMA Flood Insurance Reform Flood Mapping Program Integrated Project Team Progress

