



Technical Mapping Advisory Council

Annual Report to
The Honorable
James Lee Witt,
Director,
Federal Emergency
Management Agency

2000

Foreword

The Technical Mapping Advisory Council concludes its five-year term with this fifth Annual Report to The Honorable James Lee Witt, Director of the Federal Emergency Management Agency (FEMA). The Council's charter, mandated by Congress within the National Flood Insurance Reform Act of 1994, established its objective to evaluate and recommend improvements to the production, distribution, and use of Flood Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the National Flood Insurance Program (NFIP). Recommendations were requested in favor of cost-effective improvements for accuracy, quality, utility, distribution, and standards and guidelines for use in preparing and revising FIRMs and other mapping products.

Five years ago the Council began looking at paper-intensive, manual mapping processes that lacked the benefit of technological advances and the contributing input of experienced and knowledgeable professional users, since the NFIP's inception in the 1960s. The Council has, however, witnessed significant improvements. The Council looked at every aspect of the FIRM and made recommendations that should improve processes, reduce expenses, and, above all else, save lives and property.

The recommendations included in this year's report continue to support the Council's objectives for improvements to FIRMs. The Council looked at state-of-the-art capabilities and at standards and guidelines that will allow immediate change, provide for growth, and enable enhancements well into the future. However, the Council noted that fiscal budget limitations continue to prevail and to constrain implementation of its recommendations. The Council addressed the difficult questions posed by its Charter and requests that its recommendations not be subjected to dormancy.

[Original Signed]

Mark A. Riebau, Chairman
Technical Mapping Advisory Council



1.0 Introduction

1.1 Technical Mapping Advisory Council Creation and Composition

The Technical Mapping Advisory Council (the Council) was created by Congress by the National Flood Insurance Reform Act of 1994 (NFIRA). This report complies with the requirement of NFIRA that the Council submit a report annually to FEMA's Director. NFIRA mandated that the Council consist of a designee of the Director and ten additional members appointed by the Director or his designee. The membership must include:

- the Under Secretary of Commerce for Oceans and Atmosphere (or his or her designee);
- a member of recognized surveying and mapping professional associations and organizations;
- a member of recognized professional engineering associations and organizations;
- a member of recognized professional associations or organizations representing flood hazard determination firms;
- a representative of the U.S. Geological Survey;
- a representation of state geological survey programs;
- a representative of state national flood insurance coordination offices;
- a representative of a regulated lending institution;
- a representative of the Federal Home Loan Mortgage Corporation (now named Freddie Mac); and
- a representative of the Federal National Mortgage Association (now named Fannie Mae).

The Director of FEMA appointed Michael K. Buckley as the Designated Federal Officer for, and the FEMA representative on, the Council.

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Peggy Bowker

Ms. Bowker is a member of the National Flood Determination Association (NFDA), and represents that professional group on the Council. She is a former chair of the Association and was instrumental in its founding and in the development of Association policy. She is president of Flood Insurance Services, Inc., a flood-zone determination company; and Nimbus Engineers, a civil engineering consulting firm specializing in hydrology, hydraulics, and other aspects of flood control and drainage. She is a registered professional engineer in the states of Nevada and Arizona. During her career she has served as a local floodplain manager, a FEMA disaster assistance employee, a flood insurance study contractor, and a consultant for a variety of public and private interests in flood-control planning and design.

Michael K. Buckley

Mr. Buckley has over 25 years of experience and involvement with the National Flood Insurance Program (NFIP), the last 20 of which have been with FEMA. He serves as Director of the Technical Services Division, the component of the FEMA Mitigation Directorate responsible for a broad range of hazard mapping and studies to support mitigation activities.

Charles Challstrom

Director, National Geodetic Survey, National Oceanic and Atmospheric Administration (NOAA), and chair of the Global Positioning System (GPS) Interagency Advisory Council. Mr. Challstrom earned a Master of Science in Geodetic Science, and has 27 years of experience as a geodesist. He is active in various professional surveying organizations, including the American Congress on Surveying and Mapping and the International Federation of Surveyors, and has served as a municipal government official for more than 15 years.

Kari Craun

Acting Chief of the Mid-Continent Mapping Center, National Mapping Division, U.S. Geological Survey (USGS). Ms. Craun has worked in all aspects of mapping, including analog and digital map production, research, standards, and cartographic systems development. She has a B.S. in Geology from the University of Missouri-Kansas City and a M.S. in Photogrammetry from Purdue University.

Kevin R. Hickey

Consultant in the Mortgage and Lender Standards Department, Credit Policy Division at Fannie Mae, Mr. Hickey is responsible for review and analysis of credit risks for lender transactions and provides guidance on proposed new products. Mr. Hickey was appointed to the Council in 1997 and will coordinate closely with all applicable areas of Fannie Mae to assist in furthering the Council's objectives.

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Donald Hull

Honorary member and past president of Association of American State Geologists (AASG); registered professional geologist; served for 21 years as director of the state of Oregon Department of Geology & Mineral Industries; chaired the 1998 Oregon Legislative Task Force on Flood Control; currently Executive Director of Partners for Loss Prevention, a private non-profit corporation dedicated to reducing the risk of natural hazards.

Brian Hyde

Member and chair, Mapping and Engineering Standards Committee, Association of State Floodplain Managers (ASFPM), employed as state National Flood Insurance Program Coordinator for the Colorado Water Conservation Board.

Wendy Lathrop

Member, American Congress on Surveying and Mapping (ACSM), representing professional surveying and mapping associations and organizations. Ms. Lathrop is licensed as a professional land surveyor in four states and is also a professional planner. She has served as a president of state and national surveying organizations, and initiated interaction between ACSM and FEMA in 1992 to address NFIP mapping issues.

Albert LeQuang

Mr. LeQuang is Manager of Insurance Standards and Disaster Mitigation in the Mortgage Credit Policy Department of Freddie Mac.

Michael Moye

Representing regulated lending institutions, Mr. Moye is vice president of Bank of America, N.A.; president of the Advisory Board of the National Lenders' Insurance Council; Lending Industry Representative Multihazard Mitigation Council's Board of Directors; and trustee for the Association of State Floodplain Managers Foundation. He is also responsible for managing the flood-zone determination contracts for Bank of America.

Mark Riebau

Member, American Society of Civil Engineers (ASCE), Mr. Riebau represents professional engineering associations and organizations. He is licensed as a Professional Engineer in Wisconsin, Minnesota, Michigan and Iowa, and a Registered Land Surveyor in Wisconsin, and has practiced since 1969.

Mr. Riebau has been actively involved in the National Flood Insurance Program and the development of Flood Insurance Rate Maps since 1977, served as the chair of ASFPM's Mapping

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and Engineering Standards Committee for six years, and has been chair of the Technical Mapping Advisory Council since its inception.

1.2 Charter and Duties

The Charter for the Council (see Appendix 6.1) was based on the provisions of NFIRA. As required by Federal Advisory Committee regulations, it was filed with House and Senate oversight committees, the General Services Administration, and the Library of Congress; and was formally adopted by the Council. The duties and objectives of the Council as specified in its Charter are to:

- Evaluate the production, distribution and use of Federal Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the NFIP and to make recommendations to the Director for the improvement of these products.
- Make recommendations to the Director regarding: cost-effective improvements in the accuracy, quality, utility, and distribution of FIRMs and other mapping products; and standards and guidelines for use in preparing and revising FIRMs and other mapping products.
- Submit an annual report to the Director containing: a description of the Council's activities; an evaluation of the status and performance of FEMA's mapping products and activities to revise and update these products; and a summary of the Council's recommendations.

1.3 Acknowledgments

In its work over the past five years, the Council has been privileged to have the advice and counsel of FEMA staff members, Map Coordination Contractors Dewberry & Davis, Michael Baker Jr., Inc., and PBS&J as well as other experts who have attended and participated in meetings. The Council acknowledges the assistance it has received from its Technical Advisors this year: Bill DeGroot of the National Association of Flood and Stormwater Management Agencies; Ken Zwickl of the U.S. Army Corps of Engineers; Ed Pasterick and Robin Williamson of the Federal Insurance Administration, FEMA; Maureen Bryant and Larry Palmer of the Flood Insurance Servicing Companies Association of America, Inc.; and Dennis W. Lawlor of the National Emergency Management Association.

1.4 Council's Goals

Members of the Council articulated these constituent and Council goals during the initial meeting in May 1996 as reported in the Council's first Annual Report on January 31, 1997. Progress toward accomplishing these goals is reported in Chapter 5.

General

1. Ensure that Flood Insurance Rate Maps (FIRMs) reflect flood sources adequately and accurately, and include all current flood data that meet FEMA standards.
2. Increase reliability of data sources; and increase accuracy, consistency, security, transportability, and sharing of data.
3. Evaluate the need for including multiple hazards on NFIP maps.

Map Preparation

4. Improve the study and review processes.
5. Identify a U.S. base map standard that can be adapted for a variety of NFIP uses by the addition of overlays depicting area-specific information.
6. Encourage non-federal entities to improve maps.
7. Actively promote partnerships with state and local governments to improve FIRMs.

Map Determinations

8. Improve flood-zone determinations by increasing accuracy, adding details, and using digitized data.
9. Make accurate, automated determinations possible (ease of use, data integrity at issue).

Map Distribution and Distribution of Related Information

10. Improve the distribution systems for NFIP maps, Letters of Map Amendment, and Letters of Map Revision to ensure that current data are made available to local officials, subscribers, and other users.

Communication and Public Education

11. Improve activities to educate the public and other users of flood maps, and communicate with them regarding the use of the data in the NFIP.
12. Improve communication among floodplain managers, lenders, investors, FEMA and its contractors, local communities, states, partners, and other significant stakeholders that have an impact on the national flood effort (for better floodplain management).

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2.0 Activities and Accomplishments—2000

2.1 Meetings

The Council convened nine times during 2000, four times face-to-face and five via teleconference. The meetings were held as follows:

March 13-14, Silver Spring, MD

April 18, teleconference

June 1-2, Philadelphia, PA

June 26, teleconference

July 12-14, Boulder, CO

August 22, teleconference

October 2, teleconference

October 26-27, San Diego, CA

November 14, teleconference

In general, the teleconference calls were held for the purpose of reviewing and approving the minutes of the preceding face-to-face meeting, reviewing progress on issues and text for the 2000 Annual Report, and the Final Report, and establishing the agenda for the succeeding face-to-face meeting.

2.1.1 March Meeting—Silver Spring, Maryland

The meeting opened with updates from FEMA on the Administration's FY 2001 budget request for the Map Modernization Plan (MMP), modernization efforts at the Map Service Center, and the status of Map Modernization objectives.

The Council then identified and prioritized major issues remaining to be addressed in its fifth and final year. The issues identified as the most important were, in priority order:

1. Privatization and partnerships to implement the MMP;
2. Unnumbered A-Zones;
3. Prioritization of MMP objectives;

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4. Unmapped flood hazard areas;
5. Ongoing Council advisory functions; and
6. Public awareness, outreach, and education (including terminology).

The Council received three reports from FEMA. Mr. Mark Crowell provided a progress report on the coastal erosion study, *Evaluation of Erosion Hazards Study* required by Section 577 of the National Flood Insurance Reform Act of 1994 (NFIRA). This study measures the economic impact of erosion and erosion mapping on communities and the National Flood Insurance Program. Mr. Mike Grimm briefed the Council on the *Riverine Erosion Hazard Area Mapping Feasibility Study*, which was also mandated by Section 577 of NFIRA. Mr. Jack Quarles, FEMA Region VI, explained the efforts to optimize the process of scoping Flood Insurance Studies, one of the MMP objectives. Mr. Quarles led a task force to develop guidelines and tools to be used by FEMA's regional engineers.

The Council was briefed on numerous ongoing activities in the National Flood Insurance Program communities to develop elevation data that could potentially be used in improving Flood Insurance Rate Maps (FIRMs). Commander Grady H. Tuell, National Oceanic and Atmospheric Administration, Chief Photogrammetrist at the National Geodetic Survey, presented an update on recent experience with 3-D Mapping using new technologies such as IFSAR, LIDAR, and softcopy photogrammetric techniques. Mr. Bill Stein of the National Imagery and Mapping Agency presented preliminary findings from the Shuttle Radar Topography Mission that had just been completed. Mr. David B. Zilkoski, Deputy Director of the National Geodetic Survey, spoke on a cooperative USGS/NGS/FEMA project. This is an outreach and technology transfer project to teach others to make better flood maps. Mr. Bruce Parker, Chief, Coast Survey Development Laboratory, NOS, NOAA, spoke on a joint NOS-USGS mapping improvement project. The first demonstration project is in Tampa Bay. The objective is to produce a bathymetric/topographic Digital Elevation Model (DEM) for Tampa Bay with both bathy/topo data referenced to the ellipsoid but transformable to any other datum. Mr. Tom Connolly from USGS spoke briefly about the National Digital Elevation Focus Group, under the subcommittee for Base Cartographic Data in the Federal Geographic Data Committee (FGDC). Currently they are discussing the possibility of a National Digital Elevation Program modeled on the National Digital Orthophoto Program.

Finally, the Council developed an outline of its annual report and made writing assignments for sections of this report.

2.1.2 June Meeting—Philadelphia, Pennsylvania

The meeting opened with updates from Mr. Matt Miller, FEMA, on the status of Map Modernization objectives, specifically, the improved Flood Insurance Study scoping process and the Cooperating Technical Communities initiative. Mr. Miller announced that the new graphic specifications for FIRMs are posted on the FEMA Web site and that all of the *Guidelines and Specifications for Study Contractors* are being reviewed and will eventually be combined and

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posted on the web. Mr. Miller also discussed the status of the FY 2001 budget for the flood-mapping program.

The remainder of this meeting was devoted to preparation of the Council's Annual Report for 2000 and the Council's Final Report. Specific report section topics discussed in detail included:

1. Options for the continuation of the Council;
2. Unnumbered A-Zones and Unmapped Flood Hazard Areas;
3. Flood Insurance Study Reports;
4. Cumulative Effects of Watershed Development; and
5. Privatization and Partnerships to Implement the MMP.

2.1.3 July Meeting—Boulder, Colorado

The meeting began with a half-day field trip, coordinated by Mr. Bill DeGroot, NAFSMA, to sites of interest to the flood hazard mapping program, including floodways, encroachments, new development, as well as several floodplain management and mitigation projects.

Mr. Matt Miller, FEMA, encouraged Council members to subscribe to the FEMA Web site e-mail news program. FEMA hopes to add major map actions to this program soon. He announced that there would be amended rules on Letters of Map Revision based on Fill (LOMR-Fs), published about mid-August to clarify how basements in fill are treated. Regarding the FY 2001 budget, he mentioned that the House Appropriations Committee mark-up includes \$30 million for flood hazard mapping from the Disaster Relief Fund, but the requested \$12 license fee was not approved.

The Council discussed, in depth, the issues of Unnumbered A-Zones, as well as Unstudied and Unmapped Areas. These issues and recommendations will be addressed in the Council's Annual and Final Reports.

Messrs. George Cotton and Fred Lamutt of Earth Surface Systems, LLC gave the Council a presentation on their product, *SmartMaps*. They explained that *SmartMaps* is a combination of mapping data and interpretive software. They gave a demonstration of the capabilities of the program.

The remainder of this meeting was devoted to preparation of the Council's Annual Report for 2000 and the Council's Final Report. Report section topics discussed in detail included:

1. Cumulative Effects of Watershed Development;
2. Ice Jams;
3. Unmapped Flood Hazard Areas;
4. Coastal Erosion (here it was noted that the Heinz Center report on this topic has been finalized and used as input for the preparation of this section of the Council's report);
5. Unnumbered A-Zones;

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6. Partnerships;
7. Public Awareness;
8. Stream Erosion;
9. Emerging Technologies;
10. Letters of Map Change (LOMC); and
11. Risk-Based Rating of the Flood Hazard Risk.

Mr. Mike Buckley, FEMA, shared the results of the Heinz Center report on Coastal Erosion and distributed copies of the *Report Brief* and the *Summary Report*.

2.1.4 October Meeting—San Diego, California

The entire meeting was devoted to further editing of the 2000 Annual Report and the Final Report. The meeting was held concurrent with the annual meeting of NAFSMA.

2.2 Presentations and Outreach Activities by Council Members

During the course of the year 2000 several members of the Technical Mapping Advisory Council made presentations or attended meetings to discuss the purpose and progress of the Council. In addition, many articles were published discussing issues and opportunities around the Council's work. The Technical Mapping Advisory Council's objective of public awareness and involvement in floodplain management has been well supported by these activities.

There were presentations throughout the year to Land Surveyors in six states: Pennsylvania, Wisconsin, New Mexico, Kentucky, Missouri, and New Jersey. A Council representative also addressed the Lehigh Valley Planning Commission in Allentown, Pennsylvania, this year.

Additionally, presentations were made to several professional organizations devoted to floodplain management: the Association of State Floodplain Managers (ASFPM), the National Association of Flood and Stormwater Management Agencies (NAFSMA), and the Indiana Association for Flood and Stormwater Management (INAFSM). The Council was also represented at the Natural Hazards Workshop sponsored by the Natural Hazards Center, Boulder, Colorado.

Three articles appeared in the *Professional Surveyor* magazine, to discuss the Council's work. They were published during the months of March, May, and October. The printed discussions ranged in subjects from a compilation of the Council's fourth year activities to Map Modernization funding to a discussion on A-Zones. The New Jersey Society of Professional Surveyors published an article addressing flood map correction, and the surveyor's role in the process, during the summer of 2000.

Council members also attended the Floodplain Management Forum hosted by FEMA in Washington, DC in June. This meeting brought together over 40 National Flood Insurance Program stakeholders to exchange views on the effectiveness of present flood hazard identification, floodplain management, and flood insurance regulations.

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3.0 Issues

The Council has examined the issues discussed in this chapter. Recommendations that address some of the issues are included in Chapter 4.0 and are cross-referenced in this section.

3.1 Public Awareness

People tend to treat low-probability events as though they have zero probability. Consequently, as a whole, the public considers a flood event as something that happens to someone else or happens so rarely that they need not be concerned, let alone prepare or spend money on insurance premiums. Current flood risk nomenclature only exacerbates the problem, (e.g., 100-year flood, 500-year flood). Because 100 years is longer than most human lifetimes, many people act as though a 100-year flood would never affect them or anyone they know. Even the recent adoption of the phrase "1%-annual-chance flood" to replace "100-year flood" does little to encourage public action.

FEMA's Office of Public Affairs can develop more frequent pieces of information on awareness to be broadcast through its existing media channels. It can actively support public efforts to raise awareness. Examples of those efforts include brochures depicting local flooding history and potential future flooding, periodic flood articles in both trade and newsmagazines, and disaster anniversary events to keep the peril fresh in people's minds. Markers showing the height of historic floods in communities and displays in museums and on television about historic floods can remind communities of their actual flood risk.

FEMA must take other steps to help convince people that they face real risks: loss of life and property from flood. The Council believes that, at a minimum, FEMA should establish a budget for a study leading to recommendations for effective nomenclature to refer to flood probability and severity and to distinguish between those two components of flood risk. The new nomenclature should be adopted in all phases of the program, from flood zone designations and ratings, to news releases and public forums. Terminology that would make clear to the public that severity of flooding is not necessarily related to the low probability of the occurrence of flooding would greatly enhance FEMA's efforts to promote the wise use, or non-use, of floodplains for certain developments or activities. FEMA might also take the opportunity to have the Federal Insurance Administration (FIA) readdress its rating methodology at the same time. Currently, the risk rating categories are fairly broad. New nomenclature could lend itself to redefining risk categories to achieve a fairer depiction of risk through the rating process.

See Recommendations 4.1.1 and 4.1.2.

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3.2 Partnerships to Implement the Map Modernization Plan

Partnerships in the production and maintenance of Flood Insurance Rate Maps (FIRMs), particularly among federal agencies, are not new, but in the past few years have seen increased attention. It has always been important to minimize duplication of effort, but recently federal agencies have joined together to contribute to the production and updating of FIRMs. These partnerships are beginning to significantly improve the mapping products and spread the cost of maintaining FIRMs among a wider array of end-users.

The U.S. Army Corps of Engineers has long worked closely with FEMA in the production of FIRMs. Through its long-standing programs, the Corps is actively engaged in flood-loss reduction and environmental restoration studies and projects to develop technical information that can lead to updates and improvements in FIRMs.

Similarly, the U.S. Geological Survey (USGS) has a long history of support for the flood-mapping program. FEMA has recently joined USGS and other federal partners in the National Digital Orthophoto Program. This partnership will increase attention on the need to quickly finish coverage of the nation with 1-meter resolution digital orthoimagery and will provide renewed emphasis on periodic updates of digital orthoimagery. FEMA has also adopted the USGS standard for digital orthoimagery as the default, minimum base-map standard for FIRMs. In addition, FEMA has provided support for continuing and upgrading the USGS streamgaging network, which provides information critical to the National Flood Insurance Program (NFIP).

Another recent example of partnership is the National Oceanic and Atmospheric Administration (NOAA) collaboration on establishing Global Positioning System (GPS) Continuously Operating Reference Stations (CORS) and developing techniques for more accurate GPS-derived heights. The CORS network is being expanded with a focus on use in updating FIRMs and accelerating GPS elevation surveys. NOAA is also partnering with FEMA and others to demonstrate the applications of advanced remote sensing technologies (e.g., LIDAR and synthetic aperture radar) to create digital elevation models. This partnership has become part of a consortium of federal agencies, including FEMA, USGS, and NOAA, to look at development of standards and specifications for high-resolution elevation data. This group is also looking at combining resources to develop these data in areas where there are common requirements.

There is not a long-term history of comprehensive partnerships between FEMA and state, regional, and local entities in the preparation, distribution, and revision of FIRMs. That is slowly beginning to change. Several states are now developing mapping programs to update and revise FIRMs, for example the efforts in North Carolina, California, and Louisiana. These programs have been or are being developed in close coordination with FEMA to ensure that maps produced meet the national standards for FIRMs. Minnesota has been engaged in updating FIRMs through their Flood Loss Reduction Program since 1997.

FEMA is partnering, to the extent feasible, through its new Cooperating Technical Communities (CTC) initiative. Through the CTC, FEMA has developed partnerships with 59 local and regional governmental bodies, such as the Denver Urban Drainage and Flood Control District, Washington County, Minnesota, and the Louisville/Jefferson County (Kentucky) Metropolitan

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Sewer District to update and revise FIRMs. There is still significant room for improvement in CTC activities. Funding at the federal, state, and local levels to support map improvements through the CTC is needed.

Partnerships at the federal, state, and local levels are crucial to FEMA's ability to maintain and update FIRMs. These partnerships need to be supported and more need to be developed. The cost of updating and maintaining FIRMs is not going to decrease, but the costs cannot continue to be borne primarily by one user group through the Insurance Fund. Development of technical standards and procedures will contribute to the success of these partnerships that include the private sector.

FEMA has not historically pursued partnerships with universities or with private entities to the same degree as partnerships with public entities. There are opportunities for partnerships with universities that could benefit both FEMA and the universities. Research partnerships and internships/work study programs for students in floodplain management or related fields of study are examples. Likewise, some private entities could serve as partners to FEMA.

FEMA can build broader constituencies by clearly making an official statement that the natural and beneficial functions of floodplains should be maintained in all its statutes, not just regulations for development. Including the protection of natural resources in defining floodplains, as President Carter did in Executive Order 11988, can lead to integration among agencies and the creation of public-private partnerships to improve watershed planning and protection. Likewise, those interested in recreation and open space and those interested in hazard mitigation are potential partners.

Flooding can be a catalyst to join a variety of interested groups and agencies. Because there are more causes of flooding than just stormwater, multiobjective language should be incorporated into flood-control regulations. Collection of multiobjective data should be included in the planning and execution of a study.

See Recommendation 4.2.

3.3 Unnumbered A-Zones

Unnumbered A-Zones present problems to communities that must enforce floodplain management ordinances because of the approximation of the boundaries of the floodplain and the depth of flooding. They also present a problem to surveyors and others who must determine Base Flood Elevations (BFEs) to complete Elevation Certificates or enforce construction codes. Unnumbered A-Zones do not have published BFEs due to lack of sufficient study detail.

This practice leads to inconsistency in determination of BFEs, because of the various approximate methods available and acceptable to local and state officials. Methods vary from:

- Trying to establish the location of the gray-shaded hazard area on the ground and measuring the elevation at those limits;

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- Trying to overlay the FIRM onto a USGS topographic quadrangle (often the original basis for a FIRM) and interpolating the nearest contour followed by the gray-shaded mapped Special Flood Hazard Area (SFHA) on the FIRM;
- Applying present day ground elevations and simplified hydrologic and hydraulic analytical techniques to calculate a BFE.

The results from these varying methods yield a range of BFE values. Any of them may be more or less reliable or accurate than another in relation to the true risk of flooding. Such lack of technical detail and such inconsistencies make it difficult to equitably determine whether or not a Letter of Map Amendment (LOMA), an application for a construction permit, or a Certificate of Occupancy should be issued or denied.

In its 1999 Annual Report to FEMA's Director James L. Witt, the Council recommended that FEMA should strive to improve or eliminate all Unnumbered A-Zones. Implementing a program to accomplish this objective will require many years to accomplish, even with a major increase in funding, and may never happen without additional funds. Consequently, users of maps that contain Unnumbered A-Zones need assistance and training on how to use the maps effectively.

See Recommendations 4.3.1 and 4.3.2.

3.4 Unmapped Flood Hazard Areas

There is an unknown, but significant, number of communities for which mapping of flood hazards is incomplete or nonexistent. For the most part, if a community was overlooked when Flood Hazard Boundary Maps were developed by the Department of Housing and Urban Development, prior to the creation of FEMA, the community has not received a Flood Insurance Rate Map (FIRM). There are several reasons why some communities were overlooked in the late 1960s and early 1970s; among them are:

- Low population densities and the perception of low growth;
- Little historic evidence of floods;
- Inadequate or no base map availability; and
- Funding constraints.

In addition to communities that have never been provided with a FIRM, some flood hazard areas within participating communities have likewise been overlooked or ignored. Reasons include:

- Drainage areas of less than 1 square mile;
- Annexations (lands originally outside a city boundary, excluded from the city FIRM, that were annexed prior to the initiation of an adjoining county into the NFIP at a later date); and
- Funding constraints.

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Many of the communities that lack flood hazard mapping have experienced floods in the past 30 years, yet FEMA has been unable to produce or improve maps for these communities. Where maps are not available, flood insurance is not required under the NFIP, and floodplain regulations do not apply. These areas must be identified and mapped.

FEMA developed the Map Needs Update Support System (MNUSS) as a tool for prioritizing mapping update needs. MNUSS was initially developed for determining update priorities for communities that have already been studied but are in need of updates. FEMA needs to expand MNUSS to address study needs for unmapped communities as well. Many of the questions that should be answered for an unstudied community are the same as those that should be answered for a studied community where maps may need to be updated:

- What is the rate of community growth?
- What is the approximate magnitude of the floodplain?
- What is the likelihood of future growth in the floodplain?
- What flood hazard mitigation needs may support the need for floodplain mapping?

Whether a mapped community/area should be the subject of a full detailed study could be decided by a MNUSS examination of the estimated flood hazard and anticipated growth in combination with a community field visit by the state or FEMA. During that community visit, local officials could provide information for prioritizing mapping needs. The reason for considering a range of techniques is potential cost-savings for FEMA and other cooperating entities. A full detailed analysis is costly and should be performed only in those instances where a thorough hydraulic analysis is needed. Some less costly alternative hydraulic analysis techniques, which still provide more detail than current approximate studies, should be available for areas of lesser study priority.

Regardless of the level of study selected, flood hazard areas must be mapped to slow the ever-escalating costs associated with flood-related disasters.

See Recommendation 4.4.

3.5 Coastal Erosion

Coastal erosion and flooding in the coastal environment are closely related processes that will predictably lead to human and economic losses as well as fiscally significant costs to the NFIP in future years. Coastal erosion will impact the Atlantic, Gulf, Pacific, and Great Lakes coasts. These losses and costs can be expected to grow as development activities increase the population and investment in coastal properties that are vulnerable to erosion. Further exacerbation of property damage and insurance losses may result from a rise in sea level due to climate change.

Three factors contribute to the current insurance losses for coastal properties:

- Current FIRMs do not inform coastal property owners of the risk of erosion even though such erosion can contribute significantly to future flooding;

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- There is a lack of readily available detailed maps showing erosion-prone segments of the coastline and the rate of erosion at these locales; and
- There are no formally adopted standards for coastal erosion mapping. The lack of uniform standards results in a proliferation of mapping techniques and a resulting lack of credibility of maps.

An analysis published in 2000 by The Heinz Center in Washington, D.C., *Evaluation of Erosion Hazards* (www.heinzcenter.org), resulted in the development of numerous policy options. The Heinz Center report provided an in-depth economic analysis of insurance and other losses caused by coastal erosion based on pilot coastal erosion rate mapping conducted by FEMA in 1997 and 1998. The report noted the seriousness of coastal erosion. Roughly 1,500 homes will be lost to erosion each year, on average, for the foreseeable future with costs of \$530 million annually. The NFIP is expected to pay approximately \$80 million per year for damage caused by erosion, although not all coastal erosion losses are eligible for compensation.

The Heinz Center report properly noted that coastal erosion rate maps based on historic erosion rates are needed for a variety of purposes. For example, these maps are needed for effective public education to discourage new construction on undeveloped property in hazardous areas. Furthermore, erosion maps are needed to preserve and possibly implement other policy options (e.g., the equitable pricing of flood insurance). In many states, coastal communities and state agencies will be able to establish and better enforce land use policies, such as setback limits for new construction, if credible erosion rate maps are readily available.

Although analysis of historic erosion patterns and systematic mapping of coastal erosion rates will require a significant federal expenditure, the cost of other erosion mitigation techniques is far greater. For example, The Heinz Center report estimated that beach replenishment and maintenance to protect eroding areas typically cost \$300,000 per mile of coastline and may not be effective in the long term. In comparison, erosion mapping is expected to cost a few thousand dollars per mile and will be cost-effective if development is avoided on only a small percentage of the currently undeveloped property in eroding areas. A principal recommendation in this report is particularly noteworthy:

Congress should instruct the Federal Emergency Management Agency to develop erosion hazard maps that display the location and extent of coastal areas subject to erosion. The erosion maps should be made widely available in both print and electronic formats.

The report concluded that:

...without accurate information on erosion, state and local decision makers and the general public will not be fully aware of the coastal hazards they face, nor will they be able to make use of this information for land-use planning and erosion hazard mitigation.

Clearly floodplain maps which depict the coastal flood hazard based on today's coastal topography, not considering the effects of future erosion, greatly understate the future flood risk in those areas where erosion is a problem. In those erosion-prone areas property owners,

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potential buyers, and local officials are all unaware of the true flood risk. The Council acknowledges and agrees with the following language contained in the FY 2001 Senate Appropriations Committee report:

The Committee supports the recommendations contained in The Heinz Center Evaluation of Erosion Hazards and directs FEMA to put together a plan to develop the location and extent of coastal areas subject to erosion including a cost estimate and time frame.

Experience with other natural hazards has shown that credible maps provide a basis for effective public education and for the design and implementation of mitigation strategies to reduce the risk posed by these hazards. For example, hazard mapping is widely used for earthquake loss reduction. Similarly, tsunami flood hazards are systematically mapped by Pacific coastal states and used by some as the basis for statutory limits on new construction in hazardous areas. Landslide hazard maps are routinely prepared to protect dangerous lands from development that can lead to loss of life and property. In relation to flood hazards, the success of the NFIP (including insurance placement and rating, land use regulation, and building code enforcement) is based on systematic mapping of flood hazards and the public availability of FIRMs.

See Recommendations 4.5.1 and 4.5.2.

3.6 Riverine Erosion

On some stream reaches, high flows will cause streambank erosion, channel bottom erosion, deposition, or migration. These processes occur either in addition to overbank flooding or in place of overbank flooding. In some places prone to these processes, more property damage is caused by erosion or channel instability than by overbank flooding. Land that appeared superficially to be safe from flood hazards may literally fall into the stream channel or become part of a new, relocated channel. Severe deposition can raise the channel bottom sufficiently to cause substantial localized increases in flood elevations, thereby putting land into the 100-year floodplain that was formerly out of that floodplain. Buildings already constructed on such land, originally safe from flooding, are suddenly placed at risk.

Current FIRMs do not provide any information regarding erosion or channel instability. In fact, hydraulic modeling used to develop FIRMs has historically assumed that the stream channel remains completely unchanged, regardless of whether or not that is physically possible. FEMA prepared a study of riverine erosion, *Riverine Erosion Hazard Areas, Mapping Feasibility Study*, dated September 1999. (www.fema.gov/fhm/ft_reha.shtm) That report proposes considering stream reaches prone to erosion or channel instability differently from those reaches that do not face such problems.

The FEMA erosion report examined methodologies used in various communities throughout the country for predicting riverine erosion risk. The report included a discussion of riverine erosion processes and an examination of methodologies for the evaluation of channel changes. A literature review consisting of 12 case studies from locations throughout the country was conducted. The study assessed the technical feasibility of delineating future erosion areas and the

3.0 Issues

cost of any such delineation. Finally, options for implementation were considered. The report concluded (*Executive Summary*, page 11):

- *It is technologically feasible to map riverine erosion hazard areas. Flexibility in the choice of analysis techniques is needed to address the site-specific conditions.*
- *Riverine Erosion Hazard Area (REHA) delineations for a period of 60 years are possible; however, better predictions may be achieved for a shorter time span, such as 30 years, with periodic revisions.*
- *The analytical methods used should be able to provide an indication of the reliability of REHA delineations.*
- *Average study values [costs] are \$2,000 - \$3,000 per mile for geomorphic methods, \$6,000 - \$7,000 for engineering methods, and \$10,000 - \$12,000 for mathematical modeling methods.*
- *The cost of mapping REHAs nationwide ranges between approximately \$200 and \$300 million. This estimate is based on limited information.*
- *Implementation of erosion regulations can be either done as an extension of the NFIP or delegated to local jurisdictions with support from the federal government.*

FEMA maps the 100-year or 1%-annual-chance floodplain. Applying a similar probabilistic analysis to erosion risk will require data that are not always readily available. These data might be annual measurements of erosion or careful streamflow measurements and actual erosion measurements made during and immediately after flood events. In many instances, mapping erosion risk without correlating that risk directly to a frequency still will provide useful information for local land use control and watershed management. In addition, information about the risk of channel deposition or channel migration will have similar value, even when it is not tied to a frequency.

The September 1999 riverine erosion study was not intended to evaluate erosion protection or stream restoration methodologies. It is likely that the application of some of these methodologies on certain specific stream reaches will reduce the risk of erosion or channel instability. Currently, there is no policy to evaluate the erosion risk prior to protective measures and then reevaluate that risk after those measures are in place.

The issue of erosion and channel instability risk evaluation and the related issue of risk reduction are both complex. FEMA, states, local governments, the private sector, and academia will all need to contribute to an improved understanding of these issues and the development and implementation of technical standards and procedures to address them. Aside from the Arid West Conferences, sponsored every two years by the Arid Regions Committee of the Association of State Floodplain Managers, there is no long-term history of coordination among all of these parties concerning erosion and channel instability. Such coordination will be needed to:

- Understand the physical processes and their causes;

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- Evaluate and approve mapping techniques for depicting areas prone to erosion and channel instability;
- Evaluate methodologies for mitigating erosion and channel instability;
- Develop quantitative and qualitative standards for approval or disapproval of proposed mitigation of erosion and channel instability; and
- Develop appropriate insurance procedures and standards for areas prone to erosion and channel instability.

See Recommendation 4.6.

3.7 Ice and Debris Jams

In certain areas of the country, some stream reaches may experience ice jam flooding. Such flooding may occur in the winter due to a buildup of ice at hydraulic constrictions, such as bridges, or at locations of slow flow, such as reservoirs, reducing channel capacity upstream. Ice jam flooding may also occur during warm spells in the winter or during spring melts when ice on frozen streams begins to break up and move, again causing reduced channel capacity.

A problem that can cause similar impacts during all riverine floods, whether or not they are caused by ice jams, is the accumulation of debris at bridges, culverts, and other hydraulic constrictions. Such debris accumulation can greatly increase flood depths upstream of these constrictions, sending floodwaters into areas thought to be outside the 1%-annual-chance, or regulatory, floodplain. Sometimes these debris dams build up and then fail suddenly, sending a wall of water downstream.

Because ice jams can greatly reduce channel capacity, flooding caused by ice jams may extend to the regulatory floodplain or farther, even though measured flows are much smaller than regulatory flows calculated by conventional hydrologic analyses. The likelihood that ice jam floods inundating the regulatory conventional floodplain may result from flows significantly smaller than regulatory conventional flows greatly complicates the task of assigning a frequency to ice jam floods. Nevertheless, readers of Flood Insurance Study (FIS) reports and accompanying maps should find information about risks of ice jam flooding for those stream reaches where ice jam flooding can happen.

Debris blockage is not normally considered in FEMA hydraulic analyses. The typical hydraulic assumption is that flow through constrictions is unobstructed. Actual flooding history suggests that blockage of constrictions happens often. The difficulty is in estimating the magnitude of such blockage at various hydraulic constrictions in the absence of documentation of historic flood events. Appropriate technical standards for assuming blockage in different geographic locations and in different configurations of structures do not exist. Without blockage standards it is more difficult to legally and politically justify inclusion of affected properties within the Special Flood Hazard Area (SFHA). Ignoring the risk of debris blockage may understate the actual flood risk in the vicinity of any constrictions that are subject to blockage.

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The response of several states and local communities that experience ice jam flooding or debris blockage has been to require a freeboard to account for the reduced capacity. Currently, a range of freeboard from 1 to 3 feet is employed by those jurisdictions. Some jurisdictions have had such requirements in place for as long as 30 years without legal repercussions regarding their enforceability. Recent studies conducted for FEMA have shown increases in BFEs in excess of six feet due to ice jams. Freeboard requirements represent a straightforward response to this problem.

See Recommendations 4.7.1, 4.7.2, 4.7.3, and 4.7.4.

3.8 Flood Insurance Study Reports

Flood Insurance Study (FIS) reports summarize the basis for creating and updating Flood Insurance Rate Maps (FIRMs). They were designed to supplement and support the FIRMs. These documents are often the only source of information readily available to map users to inform them of the source material and procedures used in FIRM creation. They contain information on how BFEs were determined, what source maps were used to delineate floodplains and by whom, and when analyses were completed, all of which is important background material to surveyors and engineers seeking to replicate information shown on the FIRM. A fundamental problem is the lack of a clear mission statement, which leads to other, more visible problems.

The more visible problems include FIS format, content, and organization. Presently, an FIS may contain some superfluous information, yet not contain some information that is needed. Important information is buried in the body of the text. Some information does not generate confidence, and various page sizes make reproduction awkward. FIS currency and availability are crucial to the proper administration of the NFIP.

Because of user needs and the current limitations of the format in use since the initial FIS report was issued near the beginning of the NFIP, FEMA should conduct a study to redesign the FIS. Engineers, surveyors, planners, floodplain managers, and contractors attempting to update FIRMs use the document. Therefore, the content and format of the document should be assessed to ensure accessibility to an array of users. Some information might better be located on the FIRMs, and some information shown on FIRMs might better be included in the FIS. As a separate issue, FEMA should rename the FIS: it is not a flood insurance study; it is a flood hazard study.

Not all FIRMs have published FISs, notably maps depicting approximate or Unnumbered A-Zones without BFEs. This lack of information leads to a problem in later replicating the original mapped floodplain delineation on the ground. Inability to tie into the original datum or replicate the mapped floodplain complicates the engineering and surveying work required for development and regulation in and adjoining identified floodplains. It can also lead to inaccurate approval or denial of Letters of Map Amendment (LOMAs), Certificates of Occupancy, and construction and development permits. All FIRMs, including those with only approximate floodplain information, should be accompanied by a report to avoid such problems.

FISs generally have not been prepared for Unnumbered A-Zones; maps containing both detailed and these approximate A-Zones do not contain source data for the Unnumbered A-Zones, and

3.0 Issues

maps depicting only Unnumbered A-Zones typically have no FIS at all. However, it is both possible and important that source and background data be preserved and documented for future use. A simple form of FIS is easily created, even as a short one or two-page report identifying the base map utilized, the elevation reference monuments and datum on which the limits of the floodplain are based, the source of flooding, and the basis of hydrologic and hydraulic analyses. The floodplain study of Shell Creek in Colfax County, Nebraska, exemplifies what a report for Unnumbered A-Zones should include. It contains the basic information listed above and is supplemented with photographs of the floodplain and surveyed cross-sections of Shell Creek.

The FIS should be updated each time any panel within a community is changed. It should be easy to identify the map change, why the change was made, and how the change was determined (analysis, etc.). The FIS should be in an electronic format for the easy update and replacement of information (remembering that each version should be archived for legal and floodplain management purposes). The FIS should include elevation reference monument locations, datum and elevations, methods used in the hydrologic and hydraulic studies, source of the community base map, and history of area flooding. It should also contain, at a minimum, a listing of every LOMA or Letter of Map Revision (LOMR) in effect for that community and preferably include copies of those current Letters of Map Change (LOMCs).

The FIS should accompany every distribution of entire sets of community maps when the FIS is requested. When only individual panels are distributed, relevant LOMCs should be included as part of the package. Map users should always be provided with a current picture of the flood hazard status of a community whenever they acquire a set of maps, whether in paper or electronic format.

Currently, the FIS includes pages of varying sizes: 8.5"x11" pages for the report sections and 11"x17" for the foldout profiles. This format makes printing production difficult and expensive. Uniform page sizes would reduce some of the problems associated with paper FIS copies. Another approach is the automation of the FIS. Providing the document in digital format eliminates the concern over original paper size, although FIS users may need to print out some of the sheets for easier reading, such as for the profiles. However, FEMA could consider printing profiles and tables directly on the FIRM, making the map a more useful document while eliminating the print-size problem in the FIS. Furthermore, digital or electronic versions of the FIS will be easier to distribute and easier to update, reducing FEMA's cost in making this valuable information more readily available.

Electronic preparation of the FIS would make it easy to provide direct links to technical backup information. Topographic maps, hydrologic maps and calculations, and hydraulic maps and calculations all could be directly linked to the digital FIS. Likewise, historic photos, earlier versions of flood maps, and submittals for LOMRs could all be made available.

Current versions of these documents vary considerably in content and format, making it difficult for the various users to find necessary information within them. Not everyone reading the study report is a technical user, and the content often contains historical flooding information that convinces lay readers of the significance and repetitive nature of flood hazards in their community. Study reports should contain:

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- Background information identifying the purpose and scope of the present study along with a summary of any prior flood studies of the covered area;
- A description of the study area (including drainage basin characteristics, study reach descriptions, climate, and maps to help locate both the general area and areas of detailed study);
- A chronological history of flooding in the area, including gage records, historic photos, and written accounts from newspapers or other sources;
- Identification of the hydrologic and hydraulic analysis methods for this study; and
- Interpretation and use of the report data, including flood frequency, discharges, and flood elevations.

The study report should address three professional needs: the source of data, the data generating processes, and repositories for backup technical data and historical map and data files. Any reader of an FIS report should immediately understand the context of the data it provides, how it was prepared, and its technical limitations. A properly prepared and written report could serve to advise community members who might then have less objection to regulations when they understand the history and severity of flooding in their area.

Digital technology will allow FEMA to pursue new formats and distribution mechanisms for its FIS reports. Direct linkages to technical backup information, historic flood photos and documentation, local requirements and procedures, and the map panels themselves could be very easily incorporated into a digital FIS report. In addition, the use of color and other graphic tools would substantially enhance the attractiveness and readability of the reports.

See Recommendation 4.8.

3.9 Letters of Map Change

Currently, review and approval of Letters of Map Change (LOMCs), including both Letters of Map Amendment (LOMAs) and Letters of Map Revision (LOMRs), consume about 35 percent of FEMA's study budget. No fees are collected for LOMAs, which correct inadvertent inclusions of areas within the SFHA, because they are considered corrections of original study limitations. LOMRs reflect post-study alteration of the floodplain and flood hazards. Fees are collected for processing LOMRs and LOMRs based on Fill (LOMR-Fs) to recover costs. However, the cost of FEMA staff time is not accounted for in the current fee schedule. The cost of incorporating study results into FIRM revision also is not accounted for. FEMA plans to revise the fee schedule to account for these issues.

The local jurisdiction, preferably a CTC, must have the ability to control, or be involved in, the issuance of LOMAs. Although a LOMA does not change the map, it does change the status of the subject structure, and this change affects how the local jurisdiction enforces its floodplain regulation. Therefore, the ability to obtain a LOMA should be part of the local permit process.

3.0 Issues

Requests for LOMRs and Conditional LOMRs (CLOMRs) are currently reviewed by one of three Map Coordination Contractors (MCCs) to FEMA. The MCCs are based in the Washington D.C., area, usually far from the project location. Their reviews can duplicate reviews by the local jurisdictions that have the land-use approval authority and are done without on-the-ground review. Local jurisdictions, particularly qualified CTCs, are in a better position to review these requests and should be allowed to do so.

LOMR-Fs present a difficult problem to FEMA in many instances because someone is required to determine the date when the fill was placed in relation to the effective date of the FIRM.

LOMAs are considered to be corrections to a map, but they also justify a waiver to mandatory insurance purchase. Because flood boundaries are delineated using contour maps with inherent accuracy limitations, flood boundaries can be plotted inaccurately. There is often debate about whether the gray line on the map or the official flood elevation determines the floodplain. Lenders, flood zone determination providers, and insurance companies use the line on the map, but local building officials may combine the map with the elevation data.

When the creation and updating of FIRMs become electronic, the manual process of creating individual LOMRs will be simplified. The current process is cumbersome and expensive. However, the future depiction of single lot LOMAs may be limited by scale, and therefore difficult to show graphically.

FEMA should develop a process to delegate the issuance of LOMAs to local officials and their preparation to qualified professionals (wherein a professional engineer determines the BFE, a professional land surveyor determines the structure and existing ground elevations, and a local official signs off on both), whereas CTCs should be permitted to review requests for LOMRs and CLOMRs and make recommendations to FEMA, as their contractors do now.

See Recommendation 4.9.

3.10 Cumulative Effects of Watershed Development

Currently, FIRMs underestimate flood hazard areas. The current standards do not require the study of all flood sources. For instance, future-conditions hydrology and debris blockage are seldom considered within the current standards for updating FIRMs. As a result, only current conditions are mapped, which may not be sufficient for the needs of communities experiencing changes due to development. When the cumulative effects of development are then realized, the maps do not reflect the flood hazards that communities need to consider for future mitigation planning.

The Council included a recommendation in its 1999 Report that future-conditions hydrology be incorporated into the standards for updating FIRMs. The Council feels that FEMA should explore this issue further to confirm that there is a cumulative effect to floodplains caused by development after mapping and identify methods to reduce the adverse impacts.

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3.11 Dam-Induced Flooding

Most people believe that dams, particularly flood control dams, reduce the threat of floods. It is true that dams that are well designed, properly constructed, and adequately maintained and operated can, and do, reduce flooding. Unfortunately, thousands of dams throughout the nation do not meet these criteria and increase, rather than decrease, the potential for flood damages and loss of life. Dams have failed, causing major loss of life and property damage, yet the threats they pose are not identified on FIRMs.

Even dams that have been well maintained can pose a threat. Many dams are capable of passing flood flows well in excess of the 1%-annual-chance flood. Such dams attenuate the flood peaks of lesser floods, releasing flows well below what would have inundated the floodplain had the dam never been built. Over time, this practice creates a false sense of security, and people have occupied the floodplain. When a major flood occurs, this new development is certain to be flooded, simply by the act of the proper operation of the dam.

FIRMs could reflect the potential for failure, particularly where dams do not meet state or federal design and maintenance criteria, and could reflect the capacity of dams that do meet such standards.

4

4.0 Recommendations

4.1 Public Awareness

4.1.1 *FEMA should fund a study leading to recommendations for effective nomenclature to be used in referring to flood potential and severity.* The new nomenclature should be adopted in all phases of the program, from flood zone designations and rating, to news releases and public forums.

4.1.2 *Subsequent to all Presidential Major Disaster Declarations for floods, a portion of available funds should be used for documentation, information, and public recognition of those floods.* It is important that citizens of affected communities know the hazards their community has already faced and could face again.

See Section 3.1 for further discussion of this issue.

4.2 Partnerships to Implement the Map Modernization Plan

FEMA should continue to develop and support partnerships with other federal agencies, states, local and regional governments, citizens, and other organizations in the development, updating, and revision of Flood Insurance Rate Maps (FIRMs). Financial support through these partnerships is critical. FEMA should target study funds to support efforts with these partners.

FEMA should continue to develop incentives to encourage states and local governments to take an active role in updating and revising FIRMs. These activities would include updates due to land development or infrastructure changes as well as post-disaster verification of the extent and depth of flooding shown on FIRMs.

See Section 3.2 for further discussion of this issue.

4.3 Unnumbered A-Zones

In 1999 the Council recommended that “FEMA should strive to eliminate or improve Unnumbered A-Zones without BFEs.” In developing a strategy to accomplish this objective, FEMA should:

4.0 Recommendations

4.3.1 *Collaborate with professional organizations representing surveyors and engineers to ensure quality and competence in interpretation of Unnumbered A-Zones and Base Flood Elevation (BFE) determinations through an educational and training process.*

4.3.2 *Ensure that all future Flood Insurance Studies (FISs) for communities where Unnumbered A-Zones will be newly designated or revised are fully documented to include information about topography, hydrology, and hydraulics.*

See Section 3.3 for further discussion of this issue.

4.4 Unmapped Flood Hazard Areas

FEMA should collaborate with states and utilize Mapping Needs Update Support System (MNUSS) to help determine priorities for unmapped areas and communities.

Included in the term “unmapped communities” are communities and areas without any floodplain map of any kind, communities with a floodplain map prepared by an agency other than FEMA, communities with maps of some, but not all, of their floodplains, and communities mapped by FEMA as D-Zones, areas of possible but undetermined flood hazard. The highest priority communities should be mapped as quickly as possible.

See Section 3.4 for further discussion of this issue.

4.5 Coastal Erosion

4.5.1 *The Council recommends that FEMA develop and distribute standards, in collaboration with federal and state agencies, on coastal erosion rate mapping techniques to ensure credibility of erosion maps.*

4.5.2 *FEMA should collect coastal erosion rate information in collaboration with appropriate federal and state agencies for inclusion on all new or restudied FIRMs on the Atlantic, Gulf of Mexico, Pacific, and Great Lakes coasts.*

See Section 3.5 for further discussion of this issue.

4.6 Riverine Erosion

The Council endorses the September 1999 FEMA report Riverine Erosion Hazard Areas, Mapping Feasibility Study as a starting point for addressing riverine erosion risks within the National Flood Insurance Program. In cooperation with other federal agencies, state and local governments, private entities, and interested universities, FEMA should promote the findings of this report in the following ways:

4.0 Recommendations

- Initiate and encourage attempts to develop technical standards for the mapping of erosion and channel instability risks, with and without correlation to specific risk frequencies;
- Encourage all efforts to map such risks;
- Support similar efforts to evaluate current methodologies for protecting streams from erosion and for reducing channel instability;
- Examine ways that current FEMA regulations encourage or discourage erosion reduction methodologies and what technical or regulatory changes might be appropriate; and
- Encourage all efforts to develop mapping standards and techniques, map erosion or channel instability risks, and reduce those risks, even when those efforts are made independent of FEMA.

See Section 3.6 for further discussion of this issue.

4.7 Ice and Debris Jams

4.7.1 *Freeboard for Ice Jams and Debris Blockage: FEMA should urge communities and states that have experienced problems with ice jam flooding or debris blockage to adopt and enforce a freeboard to account for these problems.*

4.7.2 *Ice Jams: FEMA should continue to provide specific technical guidance for study contractors studying flood risks in communities where ice jam flooding is a concern. In addition, FEMA should ensure that FIS reports and FIRMs for such communities include, at a minimum:*

- A discussion of the history of and the current known risk of ice jam flooding, including the estimated frequency of ice jam events and the extent of flooding in terms of area affected;
- A discussion, to the extent possible, of the quantitative relationship between ice jam flooding and conventional flooding (e.g., percent reduction in channel capacity due to ice jams; flow in cubic feet per second [cfs] at which ice jam flooding will extend to the boundaries of the 100-year conventional floodplain); and
- Inclusion of specific locations within the community where ice jam flooding is a known risk, noted graphically as a thematic layer on the community's FIRM.

4.0 Recommendations

4.7.3 Debris Blockage Documented in Presidential Major Disaster Declarations: Subsequent to all future Presidential Major Disaster Declarations for floods, FEMA should require that blockage experienced during those floods be documented in detail. Furthermore, FEMA should provide funding to accomplish such documentation.

Documentation of the parameters that might predict the percentage and location of debris blockage at hydraulic constrictions (e.g., bridges, culverts, irrigation structures, inlets to channelization projects, etc.) on various stream types in various regions of the country should be conducted, using each Presidential Major Disaster Declaration as a case study. The objective of this study should be to develop technical standards for appropriately modeling debris blockage at hydraulic constrictions. Local and state officials and representatives of other federal agencies should be involved with FEMA and its consultants in arriving at conclusions and recommendations.

FEMA should cooperate with the Federal Highway Administration; state departments of transportation, geology, and emergency management; local road and bridge agencies; and interested universities in examining this risk. Both theoretical and historic information and evidence regarding debris blockage should be developed and evaluated.

4.7.4 Debris Blockage: FEMA should ensure that for communities either demonstrating a problem with debris blockage or expressing a concern about debris blockage on any of their streams, the FIS reports should include, at a minimum:

- A discussion of the history of and the current known risk of debris blockage during flooding, including the estimated frequency of blockage events and the extent of flooding in terms of area affected;
- A discussion, to the extent possible, of the quantitative relationship between debris blockage flooding and unobstructed flooding (e.g., percent reduction in channel capacity due to debris obstructions; flow in cfs at which debris blockage flooding will extend to the boundaries of the 100-year unobstructed floodplain); and
- Inclusion of specific locations within the community where debris blockage is a known risk, noted graphically as a thematic layer on the community's FIRM.

See Section 3.7 for further discussion of this issue.

4.8 Flood Insurance Study Reports

FEMA should reinvent the Flood Insurance Study (FIS) report by:

- Renaming the reports as Flood Hazard Study (FHS) reports;
- Reissuing all out-of-stock FISs in digital format;

4.0 Recommendations

- Revamping the format and contents of FHS reports to provide information about data sources, data-generating processes, data repositories, and the historic and geographic extents of flood hazards on a watershed basis;
- Fully documenting the study methods used in the preparation of all FIRMs; and
- Preparing all FHS reports in digital form and making them available on FEMA's Web site.

See Section 3.8 for further discussion of this issue.

4.9 Letters of Map Change (LOMCs)

FEMA should develop a process to delegate Letter of Map Amendment (LOMA) and Letter of Map Revision based on Fill (LOMR-F) authority to local jurisdictions and qualified professionals and to delegate reviews of requests for Letters of Map Revision (LOMRs) and Conditional LOMRs (CLOMRs) to qualified Cooperating Technical Communities (CTCs).

See Section 3.9 for further discussion of this issue.

5

5.0 Progress

The final step each year in the Council's efforts is the formulation of recommendations to be included in the Annual Report to the Director of FEMA. FEMA's response to most of the recommendations is reflected in FEMA's Map Modernization Plan (MMP). The Council is pleased to have been asked to participate with the work groups that were formed to address MMP objectives and to offer its input on the various issues that the Council has recommended be addressed. The MMP will not become a reality without significant increases in funding; however, the Council is gratified that many MMP objectives are currently being addressed or have already been implemented by FEMA to the extent possible within the agency's fiscal constraints.

5.1 Map Modernization Plan Objectives

Based on accomplishments to date and current priorities for implementing certain components of the MMP, FEMA has updated the list of Map Modernization objectives identified in FY 1998. These updated objectives are outlined below.

5.1.1 Completed Map Modernization Objectives

Items that are fully developed, ongoing components of the flood hazard mapping program will no longer be considered as Map Modernization objectives.

- Flood hazard mapping Web site architecture (on-line October 1998)
- FEMA Map Assistance Call Center (operational January 1999)
- Multi-year study contracts (implemented at regional office discretion)
- *Guidelines and Specifications for Flood Map Production Coordination Contractors* (completed February 1999)
- Memorandum of Agreement with Department of Defense for the use of the Precise Positioning Service (signed November 1998)

5.0 Progress

5.1.2 Ongoing Program Objectives

These ongoing flood hazard mapping program objectives are no longer considered as Map Modernization objectives but are continuing under normal operations of FEMA's flood hazard mapping program.

- Existing Cooperative Initiatives
- Awarding of new Map Coordination Contracts
- Map Service Center contract
- 44 CFR 65.5 Regulatory Reform
- Erosion study research
- Community Rating System (CRS) Task Force
- Assessment of user fees

5.1.3 Deferred Objectives

Due to resource limitations, these FY 1998 objectives have been deferred.

- Revise *Guidelines and Specifications for Study Contractors* (FEMA 37) dated January 1995
- Unmapped community inventory
- Zone V guidelines and specifications
- Revise *Appeals, Revisions, and Amendments to NFIP Maps: A Guide for Community Officials* dated December 1993

5.1.4 New Objectives

These new objectives have been identified and initiated.

- Automated hydrologic and hydraulic modeling
- Zone A areas
- Scoping of Flood Insurance Studies

5.1.5 Active Map Modernization Objectives

With the changes identified above, there are now 23 active Map Modernization objectives. These objectives, as follows, are grouped into three categories.

A. Products and Standards Objectives:

1. **Develop product specifications for Digital Flood Insurance Rate Maps (DFIRMs).** The DFIRM product involves converting the existing inventory of manually produced Flood Insurance Rate Maps (FIRMs) to digital format.

5.0 Progress

The new digital product will address maintenance needs as well as restudy needs.

2. **Develop revised, minimum base map standards.** Base maps cover the entire geographical area of a community and include roads, railroads, streams, and other physical features, as well as corporate limits and section lines. These map features are employed by map users to locate properties and structures relative to floodplains. The objective is to establish and utilize minimum base map standards for all new FIRMs.
3. **Advanced Remote Sensing Technologies.** This objective assesses LIDAR, IFSAR, and LIDAR/IFSAR fusion for use in gathering topographic and base map information for Flood Insurance Studies (FISs). This objective also includes, as appropriate, development of guidelines and specifications for these technologies in FEMA 37.
4. **Automated hydrologic and hydraulic modeling.** This objective is to assess the available technologies to automate the different aspects of floodplain analysis, including hydrology, hydraulics, and mapping.
5. **Zone A areas.** This objective is to develop a protocol to address the 50 to 70 percent of the Special Flood Hazard Areas (SFHAs) on FEMA flood maps that are designated as having approximate or Unnumbered Zone As.
6. **Promote implementation of *Guidelines for Determining Flood Hazards on Alluvial Fans*.** The revised *Guidelines* provide technical guidance for the identification and mapping of flood hazards occurring on alluvial fans, regardless of the level of fan forming activity, including active and inactive alluvial fan flooding. The *Guidelines* take into account that multiple variables can affect alluvial fans and flooding on alluvial fans, such as climate, fan history, vegetation, and land use.
7. **Complete coastal erosion studies required by National Flood Insurance Reform Act of 1994.** This objective provides for the completion of the evaluation of erosion hazards mandated by Section 577 of the National Flood Insurance Reform Act of 1994 (NFIRA).
8. **Develop recommendations for using future-conditions hydrology for the National Flood Insurance Program (NFIP).** Flood risk information presented on the flood maps is based on the existing conditions of the floodplain and watershed. The objective is to recommend ways to incorporate floodplain delineations based on future land-use and development conditions in the FIS process.
9. **Riverine Erosion Hazard Area Feasibility Study.** This objective is to conduct the Riverine Erosion Hazard Area (REHA) Mapping Feasibility Study in response to Section 577 of NFIRA.

5.0 Progress

B. Process Objectives:

1. **Mapping Needs Assessment Process.** A complete, accurate assessment of flood hazard mapping needs is essential for FEMA to develop priorities and expend the flood hazard mapping budget in the most cost-beneficial manner.
2. **Scoping of Flood Insurance Studies.** The purpose of this objective is to develop guidance and identify tools to be used by FEMA's study managers during the scoping phase of the flood hazard map development and production process.
3. **Optimized Study Process.** The purpose of this objective is to optimize the FIS process so that each community's FIRM can be created, revised, distributed, and stored more efficiently and effectively.
4. **Cooperating Technical Communities (CTCs).** This objective is to develop and implement the CTC initiative whereby partnerships are formed with communities, states, and/or regional agencies to fully integrate them into FEMA's flood hazard mapping process.
5. **Monitoring Information on Contracted Studies (MICS).** As the regional engineers' workload continues to increase, automating portions of the study contractor monitoring process is necessary to maintain the quality of the FIS work. MICS is a software application that will enable FEMA to monitor the FIS process from identification of the communities to closure of the study.
6. **LOMA 2000.** LOMA 2000 is the name given to a new software package that is currently being developed to automate Letter of Map Change (LOMC) production.
7. **Improved LOMR process.** This objective is to improve the Letter of Map Revision (LOMR) process by developing technical and administrative enclosures that succinctly describe map changes and community responsibilities as a result of LOMRs.
8. **Post-flood hazard verification.** Flooding events provide a valuable opportunity to evaluate the mapped flood hazards. This objective is to develop standard procedures for verifying the accuracy of the FIS and FIRM for a presidentially-declared disaster area and, if necessary, revising the FIS and FIRM.

C. Other Program Improvement Objectives:

1. **LOMA and LOMR-F delegation.** This objective has been created to investigate and address the issues and concerns regarding the delegation of the LOMA and LOMR-F authority to the community and/or private sector, particularly professional licensed surveyors and engineers.

2. **Map Modernization outreach.** This objective is to develop and implement a marketing plan for the MMP. It seeks to publicize the MMP to facilitate progress on all the other objectives of the plan.
3. **Regulations and laws.** As plans and specifications are finalized for the other objectives, the regulatory impacts of the MMP will be evaluated.
4. **National Geodetic Survey Partnership.** Develop a formal partnership between FEMA and the National Geodetic Survey (NGS) to improve coordination and cooperation.
5. **U.S. Fish and Wildlife Service partnership to improve mapping of Coastal Barrier Resources System areas.** This objective is to establish partnership with and provide technical assistance to the U.S. Fish and Wildlife Service to improve mapping of Coastal Barrier Resources System (CBRS) areas.
6. **Participation in the U.S. Geological Survey National Digital Orthophoto Partnership Program.** This objective is to establish a partnership with USGS through the National Digital Orthophoto Partnership (NDOP) program.

5.2 Council's Recommendations

In the Council's first four Annual Reports a total of 23 recommendations were made. The recommendations are listed below, by the year they were made.

1996 Technical Mapping Advisory Council Recommendations

1. **Retention of Maps and Map Information.** Establish an archival system for maintaining in perpetuity, for historic and legal purposes, all Flood Insurance Rate Maps (FIRMs) and supporting technical data.
 - ✓ Current Map Service Center (MSC) and Map Coordination Contractor (MCC) procedures are to maintain archives of all maps, reports, and supporting data. As resources allow, an indexing system for retrieval will be implemented.
2. **Distribution Processes.** Distribute Letters of Map Change (LOMCs) with each map ordered; individuals or companies that subscribe to automatic updates should automatically receive copies of pertinent LOMCs.
 - ✓ Currently cost-prohibitive; long-term, all data will be available on the Internet.
3. **Forms.** Distribute, via the Internet, certification forms required for map revision requests.
 - ✓ The [MT-EZ](#), [MT-1](#), and [MT-2](#) forms as well as Flood Insurance Study (FIS) [Data Request forms](#), [Elevation Certificates](#), [Flood Proofing Certificates](#), and [Standard Flood Hazard Determination forms](#) are available for downloading at FEMA's

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flood hazard mapping Web site (www.fema.gov/fhm/). They are available as .pdf files, .zip archives, and as Microsoft Word documents.

4. **H.R. 3340.** Develop a position on legislation that would delegate authority to issue LOMCs to entities other than FEMA.
 - ✓ H.R. 3340 never passed.
 - ✓ A meeting was held on December 9, 1998, with the state of South Carolina and professional organizations to discuss the issues involved with LOMC delegation. A summary report was prepared and distributed on August 17, 1999, to the FEMA Regional Mitigation Divisions, the ASFPM Mapping Committee, and the Technical Mapping Advisory Council.
 - ✓ FEMA will continue to examine all aspects of the LOMC processes and determine what can be modified to simplify the processes.
5. **Scribing.** Implement newer technologies than the scribing method for the production and dissemination of FIRMs.
 - ✓ All updates to existing maps are produced digitally, where cost constraints allow.
 - ✓ All newly created maps are produced digitally.
 - ✓ MMP includes digitizing approximately 81,500 panels currently in manual format (approximately 18,500 converted to date) in FYs 2001-2005, conditional on the availability of funding.
 - ✓ A distribution plan for new DFIRM products is under development.
 - ✓ FEMA's Map Service Center (MSC) is investigating means of scanning maps and making them available on FEMA's Web site.
 - ✓ Draft DFIRM graphics and database specifications developed for new digital map products.

1997 Technical Mapping Advisory Council Recommendations

1. **Flood Insurance Studies (FISs).** Improve the FIS process by shortening Study Contractor (SC) process; permitting multi-year contracts to SCs; ensuring agreement on base map among SC, Map Coordination Contractor (MCC), the state, FEMA, and the community earlier in the process; and providing for intermediate reviews of mapping elements.
 - ✓ Multi-year study contract mechanism available to the FEMA regional offices for FY 2001 new study starts.

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- ✓ FEMA has designed an optimized study process consisting of three components: Mapping Needs Assessment, Project Scoping, and Map Production. Features include:
 - Tasks to complete studies will be distributed to SC, CTC, and MCC to maximize expertise and capability of each.
 - Base map will be identified and agreed upon during FEMA's scoping coordination with the community and state.
 - All participants in the study process will complete work concurrently (i.e., CTC digitizes effective information for non-restudied streams while SC completes restudy) to shorten time frames.
 - Communities, states, and/or regional agencies will have the opportunity to review analyses and mapping at intermediate points in the study process.
 - Will continue implementation of optimized process in FY 2001.
 - Developed draft documents providing guidance for scoping flood mapping projects. Project scoping is intended to enable FEMA to achieve a “best value” for completing any mapping project by prioritizing and addressing a community’s flood mapping needs, and distributing the work based on the strengths and capabilities of all available resources.
- 2. **Base Maps.** Improve base maps and review and update existing standards, in consultation with the Federal Geographic Data Committee (FGDC). Ensure strict adherence to the standards.
 - ✓ Base Map Specifications finalized and distributed to the FEMA Regional Mitigation Divisions and the Council on May 26, 1999. Also on FEMA’s Web site at (www.fema.gov/fhm/frm_bsmpt.htm). Contain requirements for:
 - Contents,
 - Accuracy,
 - Currentness, and
 - Ability to distribute.
 - ✓ Community-supplied or state-supplied data that meet minimum requirements will be first choice.
 - ✓ USGS Digital Orthophoto Quadrangles (DOQs) will be the default base map for community or state data that are unavailable or do not meet FEMA's base map specifications.
 - ✓ The Draft Standard DFIRM Spatial Database includes database attributes for required base map features and metadata. As part of the DFIRM database design

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- effort, FEMA reviewed FGDC standards for transportation features and will continue to coordinate with the FGDC regarding database attributes.
3. **Base Mapping Partnerships.** Pursue base mapping partnerships with other public, private, and nonprofit entities, such as the Census Bureau, U.S. Geological Survey (USGS), state, local, and regional agencies, to achieve cost efficiencies and exchange technical expertise.
 - ✓ FEMA is participating in the USGS National Digital Orthophoto Partnership (NDOP) Program.
 - ✓ Goal is to produce DOQs for communities where a FEMA map update is planned and a community base map that meets FEMA's base map specifications does not exist.
 - ✓ Meetings have been held with USGS to discuss partnering options for the acquisition of DOQs to support FEMA's DFIRM mapping needs.
 - ✓ Digital Base Map Data Sharing and Digital Base Map Inventory are CTC mapping activities.
 4. **Digital Flood Insurance Rate Map (DFIRM).** Digitally prepare, produce, and make available all new map products resulting from studies or restudies and physical map revisions.
 - ✓ See 1996 Recommendation 5.
 - ✓ Completing design of the new DFIRM product:
 - Includes base map, georeferenced flood data, database, and new graphic specifications.
 - Graphic specifications were completed.
 - Standard DFIRM database specifications were completed.
 - Enhanced DFIRM database specifications are underway.
 - ✓ Map use policy to clarify issues for users as they migrate from paper to a digital environment is under review by FEMA.
 - ✓ Draft distribution plan under development.
 5. **Community Involvement.** Hold community meetings before, during, and after preparation of a new map product, such as a map digitized for the first time or one being converted to a countywide product, to enable community and state input to and participation in mapping issues and activities.
 - ✓ As part of the Optimized Study Process (see 1997 Recommendation 1), the scoping phase will include extensive, up-front coordination and outreach to the community.

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- For communities with flood data update needs and large countywide studies, the community coordination will typically be through a series of face-to-face meetings. The meetings will be attended by community officials, the SC, and state and/or regional agency officials.
- For communities for which the map update will be a digital conversion and/or map maintenance with no flood data updates, the community coordination may be accomplished via teleconferences with the community, state and/or regional agencies, and the MCC.
- The purpose of the coordination meetings (or teleconferences) will be to establish the scope of the project, including:
 - Validating map update needs;
 - Study reaches and methods for engineering analysis and floodplain mapping;
 - Topographic data sources;
 - DFIRM options to be included; and
 - Base map selection.
- The coordination meeting (or teleconference) will also be for FEMA to determine how to distribute the work required to complete the mapping project based on the strengths and technical capabilities of the available resources to achieve a "best value."
- ✓ Communities will also be provided the opportunity to review data and mapping at intermediate points during production.
- ✓ Final meetings with communities and citizens will be held to present the preliminary maps and receive feedback prior to initiating the 90-day appeal period, as needed.

1998 Technical Mapping Advisory Council Recommendations

1. **Map Availability and Accuracy.** Implement programmatic changes to improve accuracy, reliability, and availability of digital and graphic map data. To include:
 - New technology for preparing work maps and FIRMs;
 - Specifications for DFIRMs;
 - Internet distribution of map data; and
 - Revision of Guidelines and Specification for Study Contractors (FEMA 37).

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- ✓ Through the Advanced Remote Sensing Technologies Map Modernization objective, FEMA is assessing LIDAR, IFSAR, and LIDAR/IFSAR fusion for use in gathering topographic and base map information for FISs.
 - LIDAR: Developed guidelines and specifications; published on FEMA's Web site. Will update guidelines and specifications to test results and incorporate review comments. Will develop costing guidelines.
 - IFSAR and LIDAR/IFSAR Fusion: Contracted with the Jet Propulsion Lab through the Army Topographic Engineering Center to evaluate performance and to develop guidelines and specifications for FISs; flew mission over the Red River to collect data and evaluate performance. Continuing to evaluate Red River mission data; will develop and publish guidelines and specifications for FEMA 37; will develop costing guidelines.
- ✓ See 1997 Recommendation 4 for description of new DFIRM product.
- 2. **Minimum Base Map Standards.** Revise and ensure adherence to minimum base map standards, consistent with FGDC standards. To include:
 - Minimally acceptable tolerances for positional accuracy;
 - Feature content;
 - Age of the map;
 - Metadata requirements;
 - Georeferencing requirements.
- ✓ Base maps will be produced in cooperation with other federal, state, and community partners.
- ✓ See 1997 Recommendations 2 and 3.
- 3. **Mapping Needs Assessment Process.** Continue interaction with other entities; share and publicize preliminary results. Obtain approval from Office of Management and Budget (OMB) to collect information by questionnaire or other methods.
 - ✓ First five-year cycle completed.
 - ✓ Prepared summary fact sheets of survey results for NFIP state coordinators and members of Congress.
 - ✓ Developed report to Congress.
 - ✓ Presented survey results at ASFPM 1999 and ASFPM 2000 Conferences.
 - ✓ Working with FEMA Forms Management to develop community questionnaire for use in second five-year cycle; coordination with OMB will follow.

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- ✓ Developed *CTC Mapping Activity Statement for Assessment of Community Mapping Needs*; pilot tested by state partners in FY 1999 and fully implemented in FY 2000.
 - ✓ Developed guidance document, *Analysis and Evaluation of Community Flood Mapping Needs*, to assist CTC partners and FEMA contractors to objectively evaluate flood hazard mapping needs.
 - ✓ Two states are represented on the Map Needs Assessment Workgroup.
 - ✓ Presented the Map Needs Assessment Process at CTC training courses held in May and July 2000.
 - ✓ Provided a group of State Coordinators with access to MNUSS and conducted tutorials on how to enter mapping needs into the system.
4. **Public Awareness.** Devote education efforts to increasing public awareness of the real possibility of flooding beyond the Special Flood Hazard Area (SFHA) in any given year.
- ✓ All LOMCs removing land and/or structures from the SFHA include wording regarding the possibility of flooding beyond the SFHA and suggest the purchase of flood insurance.
 - ✓ FEMA's Mitigation Directorate has established an Outreach Branch.
 - ✓ FEMA's flood hazard mapping Web site contains extensive educational information specifically targeted for homeowners, insurers and lenders, engineers and surveyors, and floodplain managers.
 - ✓ FEMA's Map Assistance Call Center is a resource for property owners, insurers and lenders, engineers and surveyors, and floodplain managers to ask specific questions. The Call Center can directly link customers to the FIA Response Center for additional information on flood insurance.
 - ✓ Future-conditions hydrology standards are being developed (see 1999 Recommendation 1).
 - ✓ Flood insurance marketing efforts-main message in advertisements is that it can flood anywhere, anytime.
 - ✓ Agent and Lender Workshops are conducted nationwide to disseminate up-to-date information to those involved with the NFIP. These workshops contribute to the increasing awareness and improving knowledge of flood insurance.
 - ✓ FEMA's National Hurricane Survival Initiative is a first-of-its-kind public service campaign to educate residents along the Eastern Seaboard and Gulf Coast about hurricane safety and damage prevention.
 - ✓ In January 2000, new consumer print ads, designed to motivate people to take action against flooding, started appearing in national magazines. New print ads

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- that target insurance agents and lenders began appearing a few months after the new consumer print ads.
- ✓ Through Project Impact, citizens, community organizations, business and industry, all levels of government, and the media are working together to make communities safer places to live.
5. **Stream Gages.** Preserve and maintain existing stream gages and increase density of the streamgaging system. Consider incorporating rapid telemetry of gage data into existing and future stations.
- ✓ FEMA unable to implement; USGS's responsibility.
 - ✓ FEMA will continue to support and encourage USGS efforts to preserve and maintain the streamgaging network.
6. **Maintenance of Flood-Control Projects.** Work with U.S. Army Corps of Engineers (USACE) to review permitting process under Section 404 of the Clean Water Act and to develop 404 permit regulations that exempt maintenance of FEMA-credited, flood-control projects.
- ✓ USACE currently has proposed rule on changes to 404 permits; FEMA coordinating internally and with other federal agencies to provide comments. This proposed rule change does not address permit exemptions for maintenance of flood-control projects.
 - ✓ No formal action currently being taken by FEMA/USACE.
7. **Collaboration in Flood Hazard Mapping.** Be more proactive in involving communities and state organizations in the flood mapping process from its inception through completion.
- ✓ The Optimized Study Process (see 1997 Recommendation 1) will involve communities, state agencies, and regional agencies in the entire process, allowing them to help determine the study scope, review intermediate analyses and mapping, and participate in the actual analysis, data collection, and/or mapping as CTCs.
 - ✓ The CTC initiative will form formal partnerships with communities, states, and/or regional agencies to fully integrate them into FEMA's flood hazard mapping process:
 - Designated CTC partners for FY 1999 and FY 2000 pilot CTCs.
 - Completed Mapping Activity Statements for ten specific types of CTC mapping activities.
 - Conducted programmatic and technical training for CTCs and potential CTCs at FEMA's Emergency Management Institute. Sessions were held in May, July, and October 2000.

- Developed the CTC component of the FEMA flood hazard mapping Web site.
 - Most extensive undertaking to date is a Cooperating Technical State agreement with the State of North Carolina whereby North Carolina will conduct flood studies and prepare Digital FIRMs for its communities and provide the data to FEMA.
- 8. Post-Disaster Verification of Flood Hazard Data.** Allocate funds specifically for post-disaster verification activities to:
- Gather data and document event;
 - Assess the accuracy of the maps; and
 - Revise applicable maps.
- ✓ H.R. 4635 authorized \$15 million to be spent during FY 2001 for Map Modernization activities in areas that receive Presidential Major Disaster Declarations.
 - ✓ FEMA is developing a standard procedure for verifying the accuracy of the FIS and FIRM for flooded communities declared major disaster areas by the president and, if necessary, for revising the FIS and FIRM.
 - ✓ FEMA is developing a Web page to provide several tools to field engineers in a disaster setting. Some of these tools include:
 - Background information on Post-Disaster Verification of Flood Hazard data and the value of flood recovery data collection.
 - Statement of Work (SOW) templates and examples that can be downloaded from the site and customized to meet specific field engineer or disaster specifications.
 - Example scenarios to walk field engineers through the various SOWs and processes of flood recovery data collection.
 - ✓ Completion of the Web page and SOW templates is scheduled for FY 2001.
 - ✓ In the states of New York and New Jersey, following Hurricane Floyd, FEMA collected field data and compared the data to the effective Flood Insurance Studies and FIRMs. FEMA is now in the process of updating the maps for high priority needs.

1999 Technical Mapping Advisory Council Recommendations

- 1. Future-Conditions Hydrology.** Support and encourage the use of future land-use conditions in determining the hydrology for floodplain delineations.

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- ✓ Prepared a draft report, *Recommendations for Using Future Conditions for the National Flood Insurance Program*, May 14, 1999.
 - ✓ Recommendations from this report are being incorporated into a Proposed Rule. This Proposed Rule has not yet been published in the Federal Register.
2. **Unnumbered A-Zones (No Base Flood Elevations).** Strive to improve or eliminate all Unnumbered A-Zones without base flood elevation (BFE) data.
 - ✓ Formed a Work Group to examine options for addressing issues related to Approximately Studied (Zone A) Areas.
 - ✓ Developed recommendations for addressing Zone A areas, which were summarized in a paper presented at the Fall 1999 FEMA Regional Engineer's Conference.
 3. **Alluvial Fans.** Encourage adoption of the Guidelines by states, local governments, and professionals who map alluvial fans. Relate the maps to regulations and to insurance requirements. Initiate a cooperative public information and education program.
 - ✓ Developed an approach to identify and map flood hazards on alluvial fans that accounts for site-specific conditions. The approach, detailed in the *Guidelines for Determining Flood Hazards on Alluvial Fans*, addresses recommendations in a 1996 report by the National Research Council's Committee on Alluvial Fan Flooding.
 - ✓ Guidelines posted to the Internet, September 1999.
(www.fema.gov/fhm/ft_alfan.shtml)
 4. **Multiple Hazards Affecting Flood Risks.** Include in the DFIRM database information on multiple hazards that pose flood risks and can cause loss of life and property. Continue participation in the Open GIS Consortium to provide links to other sites containing hazard data affecting flood risks for retrieval by users.
 - ✓ Enhanced DFIRM Spatial Database will be expandable to include multiple hazards. A DFIRM Users Guide will be developed to provide users with information on how to add other hazard information.
 - ✓ DFIRM graphics and database design are being coordinated with HAZUS development team.
 5. **Distribution of Data: Archiving, Map Availability, and Accuracy.** Establish a retrieval system for archived data both in its possession and housed elsewhere, including an index for location of historic FIRMs, LOMCs, and technical back-up data for flood studies.

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- ✓ Initiative underway to make LOMCs and technical support data for flood studies available through FEMA's Web site.
- ✓ In FY 2001, FEMA's Map Service Center (MSC) will have a geo-indexing tool that will enable individuals to key in property addresses to determine which map panels to order.
- ✓ FEMA's MSC is investigating means of scanning maps and making them available on FEMA's Web site.



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6.1 Charter

Federal Emergency Management Agency Charter of the Technical Mapping Advisory Council

Establishment

The Director of the Federal Emergency Management Agency (FEMA) hereby establishes the Technical Mapping Advisory Council (hereinafter referred to as the Council), as directed under the National Flood Insurance Reform Act of 1994, P.L. 103-325, Title V, Section 576. The Council is established in accordance with the Federal Advisory Committee Act, 5 U.S.C. App. 2.

Objectives and Duties

1. The Council's objective is to evaluate the production, distribution, and use of Flood Insurance Rate Maps (FIRMs) and other mapping products prepared by FEMA in support of the National Flood Insurance Program (NFIP) and to make recommendations to the Director for the improvement of these products.
2. The Council shall make recommendations to the Director in the following areas:
 - a. cost-effective improvement in the accuracy, quality, utility, and distribution of FIRMs and other mapping products; and
 - b. standards and guidelines for use in preparing and revising FIRMs and other mapping products.
3. The Council must submit an annual report to the Director containing the following:
 - a. a description of the Council's activities;
 - b. an evaluation of the status and performance of FEMA's mapping products and activities to revise and update these products; and
 - c. a summary of the Council's recommendations.

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4. The Council may hold hearings; receive evidence and assistance from federal, state, or local government agencies or private firms and individuals; and conduct research as necessary to meet its objectives. The Council may draw on the expertise of its members as well as other sources when making recommendations to the Director.
5. To ensure that the Council's recommendations are consistent to the extent practicable with national digital spatial data collection and management standards, the Council's Chairperson shall consult with the Chairperson of the Federal Geographic Data Committee established under Office of Management and Budget Circular A-16.
6. The Council functions solely as an advisory body and will comply fully with the provisions of the Federal Advisory Committee Act.

Membership and Chairperson

1. The Council shall consist of a designee of the Director and 10 additional members appointed by the Director or his designee. Under P.L. 103-325, the membership must include:
 - a. the Under Secretary of Commerce for Oceans and Atmosphere (or his or her designee);
 - b. a member of recognized surveying and mapping professional associations and organizations;
 - c. a member of recognized professional engineering associations and organizations;
 - d. a member of recognized professional associations or organizations representing flood hazard determination firms;
 - e. a representative of the U.S. Geological Survey;
 - f. a representative of state geological survey programs;
 - g. a representative of state national flood insurance coordination offices;
 - h. a representative of a regulated lending institution;
 - i. a representative of the Federal Home Loan Mortgage Corporation (now known as Freddie Mac); and
 - j. a representative of the Federal National Mortgage Association (now known as Fannie Mae).
2. The Director's designee requested nominations for membership from the agencies or organizations listed above. From the submitted nominations, members were selected based on their demonstrated knowledge and competence regarding surveying, cartography, remote sensing, GIS, and the technical aspects

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- of preparing and using FEMA's mapping products. Members were notified of their appointment by letter on November 24, 1995.
3. The members of the Council shall elect one member of the Council to serve as Chairperson.
 4. The Chairperson may appoint officers to assist in carrying out the duties of the Council.

Administrative Procedures

1. The Council shall meet no less than twice each year at the request of the Chairperson or a majority of its members.
2. The Council may take action by a vote of the majority of the members.
3. At the request of the Chairperson, the Director may detail, on a nonreimbursable basis, FEMA personnel to assist the Council in carrying out its duties.
4. Council members shall not receive additional compensation for their service on the Council.
5. The annual cost to FEMA of operating the Council is \$100,000.

Duration of the Council

P.L. 103-325 stipulates that the Council terminate its activities after 5 years. The Council will terminate its activities five years after the date when all members of the Council were appointed under section 576.2(k)(b)(1) indicated above as November 24, 1995.

April 9, 1996

/S/ James L. Witt

6.2 Summary of the Interests of Constituent Organizations

6.2.1 The American Congress on Surveying and Mapping

Internet: www.acsm.net

The Organization. The American Congress on Surveying and Mapping (ACSM) is the recognized professional society for surveying and mapping associations and organizations. Named the "National Congress on Surveying and Mapping" when it was founded in June 1941, its name was changed to encompass members from throughout the world (although the majority of ACSM's 7,000 members are located in the United States). ACSM is a non-profit, educational organization comprising four member organizations: Cartography and Geographic Information Systems, the American Association for Geodetic Surveying, Geographic and Land Information Systems, and the National Society of Professional Surveyors. ACSM's objectives are to advance the sciences of surveying and mapping and related fields; to further the welfare of those who use and make maps; to encourage the development of educational programs in surveying, mapping

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and charting; and to support publications that represent the professional and technical interests of surveying and mapping.

Mapping Concerns. The common mapping interest of the ACSM's four member organizations is for mapping data that are accurate and reliable. This primary interest of licensed professionals is generated by concern for the best interests of citizens who must rely on the data provided by FEMA, such as FIRMs and Q-3 digital products. Specific areas of concern are:

- **Data quality and documentation.** ACSM has identified needs for:
 - written criteria for quality of map location data;
 - standard specifications for base-mapping scale and accuracy beyond “best available,” including minimum criteria for acceptance or rejection; and
 - specifications on how to evaluate data (for consistent analysis).
- **Application of data beyond limits of technical merit/capabilities.** ACSM is aware of inappropriate uses of data, such as digital TIGER files, and the enlargement of USGS quadrangle maps beyond mapping standards.
- **Inconsistent application of technical data.** Although FEMA has stated that the error in calculating the base flood elevation (BFE) is within plus-or-minus one-half foot, LOMAs are issued based on elevation differences down to one-tenth of a foot.
- **The technical merit of procedures.** Reanalysis of old data using new methodologies without the addition of new data is permitted for restudies, and reanalyzed old data may be placed on existing base maps without corrections. The reason given for these situations is cost savings. Reanalysis without corrective information makes the process purely academic, and ACSM believes it is an inappropriate use of FEMA funds and can also contribute to mapping inconsistencies.
- **Public reliance on a public agency.** Products described as being the basis of information for in-house use only are being released to the public for cost recapture and other reasons. The proliferation of GIS has underscored the need for extreme care in making data and metadata available. The name of a federal government agency emblazoned on data leads the uneducated public to perceive that the data are of a standard of quality generally produced by the government, although internal FEMA users know of limitations not known to the customer.
- **Enforcement of community involvement in updating procedures.** ACSM believes that failure to strictly enforce federal floodplain management statutes in communities participating in the NFIP results in harm to the public, which pays unnecessary insurance premiums in some areas, and does not purchase insurance in some areas in which it should be required.

6.2.2 American Society of Civil Engineers

Internet: www.asce.org

The Organization. The American Society of Civil Engineers (ASCE), representing professional engineering associations and organizations, is one of the oldest professional organizations in the United States, founded in 1853. ASCE has 119,000 members and has established committees to actively address many of the issues pertinent to the Council's mandate. Some of the issues are natural disaster reduction, land use, hydraulics and hydrology, urban water resources, water resources planning, coastal engineering and coastal zone management, GIS, urban drainage standards, and flood-resistant design and construction.

Mapping Concerns. ASCE is concerned about the effect flooding has on the nation's public health and welfare. ASCE is interested in seeking ways to guide new development away from flood hazard areas and ensure that structures constructed in flood hazard areas are properly flood-proofed. ASCE also is concerned that flood-protection structures, such as levees and dams, are properly designed and built to provide the anticipated protection; and that bridges do not aggravate flooding.

Sound, technical hydrologic and hydraulic analyses and correct mapping of the floodplains are the bases for guiding new development away from flood hazard areas, and for assuring that flood-prone structures are properly flood-proofed. These are the same bases used by FEMA to delineate floodplain limits on FIRMs, and used by scores of engineers in designing levees, dams, bridges and urban drainage systems.

6.2.3 Association of American State Geologists

Internet: www.kgs.ukans.edu/AASG

The Organization. The Association of American State Geologists (AASG) consists of the chief executive officers in the state geologic surveys in all 50 states and Puerto Rico. The group participates in federal and state legislative activities through a Federal Liaison Committee. Geologic hazards and related risk issues are handled through standing committees on geologic hazards and coastal processes.

Mapping Concerns. Members of AASG are interested and involved in technical analysis, mapping, and public education related to flood hazards, coastal erosion and riverine erosion, and tsunamis. Concerns include the possible misuse of geologic maps in preparing flood maps, the opportunity to incorporate flood and erosion hazards in analysis and mapping products for multiple hazards, and the updating of flood maps in coastal areas vulnerable to tsunamis.

6.2.4 Association of State Floodplain Managers

Internet: www.floods.org

The Organization. ASFPM is an organization of professionals involved in floodplain management; flood hazard mitigation; implementation of the NFIP; and flood preparedness,

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warning, and recovery. The group represents the flood hazard specialists of local and state governments and the federal government; the research community; the insurance industry; and the fields, among others, of engineering, hydrologic forecasting, emergency response, and water resources.

ASFPM supports comprehensive, nonstructural and structural management of the nation's floodplains and related water resources. The organization seeks to help the public and private sectors, through coordinated and well-informed efforts, to reduce losses of human lives and property damage resulting from flooding. It also seeks to preserve the natural and cultural values of floodplains, and avoid actions that exacerbate flooding. To reach these goals, ASFPM fosters communication among all elements of the community responsible for flood hazard activities, provides technical advice to government agencies and other entities about proposed actions or policies that will affect flood hazards, and encourages flood hazard research, education, and training.

Mapping Concerns. ASFPM's top priorities for flood hazard maps that serve their users follow.

- **Maps should enable accurate determinations.** Users of maps should be able to determine whether a specific site is in or out of the floodplain; and the relationship between floodplain information and base-map information, such as streets and corporate limits, should be valid.
- **Maps should be technically defensible.** The technical bases of the floodplain outline (hydrology, topographic information, hydraulics, plan-view delineation of the floodplain) should be stated clearly, and other appropriate professionals, using the same procedures, should get similar results. The maps should reasonably and accurately represent the 1%-annual-chance floodplain using accepted methodologies.
- **Maps should be current and comprehensive.** As mapped conditions of various types change, maps should be updated. Unstudied stream reaches should be studied before rather than after development.
- **Map revision should be simple and fair.** Errors, omissions, and inconsistencies on the FEMA maps should be corrected by FEMA quickly and easily. Changes made by others, whether they result from physical alterations of the floodplain or from new engineering analyses, should be processed quickly and easily once all pertinent technical information has been provided to FEMA.
- **Study/restudy needs should be based on the level of vulnerability to flood hazards.** The first studies/revisions should be made on stream reaches facing the greatest potential for property damage and loss of life because of encroachment in the floodplain.

ASFPM believes that maps can be improved by addressing the following issues:

- **Accuracy.** Some significant flood hazards have been mapped inaccurately or not at all. Streets and corporate limits are particular problems. Instances of

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floodplain inaccuracy also have been seen. A strong correlation between information on the maps and conditions in the field has not always been ensured.

- **Technical support.** Technical supporting information is not always available.
- **Coordination with local and state officials.** Coordination with local and state officials in the preparation and revision of flood hazard maps is not perceived to be thorough in all instances, and is perceived to lead to inaccuracies and omissions when it has not been thorough. For example, appropriate local officials have not been notified of some coordination meetings in some instances. In other instances, technical data (e.g., hydraulic analyses, topographic information or GIS base mapping) from local sources have not been used in the preparation of new FIRMs.
- **Level of map detail.** FEMA's finished maps lack sufficient topographic and cultural information to meet the needs of many users. The work maps, which are used to produce finished maps, generally are superior in terms of scale and level of detail; yet, they are neither granted any official status nor published by FEMA.
- **Mechanisms for including map information compiled by non-FEMA public agencies.** A consistent process through which FEMA can incorporate into its mapping activities the floodplain information compiled or prepared by other public entities is needed.
- **Use of new technology.** New cartographic, topographic and water resources technology such as GIS, laser-based topographic mapping, Global Positioning Systems surveying, 2-dimensional hydraulic models, and real-time hydrologic and hydraulic modeling could improve the preparation, presentation and delivery of floodplain information to all users. New means of conveying the information such as printing-on-demand, electronic presentation instead of or in addition to paper presentation, and the possible use of 3-dimensional computer imagery should be explored.

6.2.5 Bank of America

Internet: www.bankofamerica.com

The Organization. Bank of America is one of the largest financial services companies in the United States providing a diversified range of banking and certain non-banking financial services and products through its various subsidiaries.

Products and services are delivered through 4,700 banking centers and 14,000 ATMs, that serve 30 million households and 2 million small businesses in 21 states (Arizona, Arkansas, California, Florida, Georgia, Idaho, Illinois, Iowa, Kansas, Maryland, Missouri, Nevada, New Mexico, North Carolina, Oklahoma, Oregon, South Carolina, Tennessee, Texas, Virginia, and Washington) plus the District of Columbia and Hong Kong. Services are also provided through telephone and

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personal computers and through commercial banking offices that serve middle market businesses with sales of up to \$500 million.

Further, domestic and international corporations, financial institutions, and government entities are supported through offices in 37 countries in four distinct geographic regions: the U.S. and Canada; Asia; Europe, Middle East and Africa; and Latin America. The Banks deliver specialized industry expertise to the following sectors: aerospace and defense, apparel, automotive and transportation, business services, communications, construction and engineering, consumer products and services, entertainment and media, financial services, food and agribusiness, healthcare and pharmaceuticals, natural resources (chemicals, energy, paper and forest products, utilities), real estate, retail, sports, and technology.

Its mortgage division is one of the top five mortgage servicing companies, and is among the nation's top ten retail mortgage lenders. Bank of America employs approximately 158,900 individuals full time.

As a regulated lender, Bank of America is responsible for determining a collateral property's flood-zone status. If the property is determined to be located in an SFHA, the regulated lender must require flood insurance for the loan term. Until the mid-1980s, lenders were left to their own devices in determining a property's flood-zone status. The maps, in themselves, proved to be less-than-adequate tools for that purpose. Little detail existed to assist a lender in locating a property on the map. Detail that may have been provided often was inaccurate and misleading (e.g., had misnamed or misplaced streets). Many lenders simply left the determination up to the appraiser. After all, the lender's business is not cartography.

As a result of the lenders' need for better interpretation of maps, a new industry emerged: the flood-zone determination company. The lending industry is increasingly concentrating on its primary purpose of making and contracting with determination companies to interpret maps. The zone determination industry has prospered, particularly following the enactment of National Flood Insurance Reform Act of 1994 (NFIRA) and the "perpetual vigilance" rule affecting Government-Sponsored Enterprise loans. That rule requires a lender servicing such a loan to know immediately any change in the subject property's flood zone, and to act accordingly.

Mapping Concerns. Millions of dollars are spent annually to locate properties on flood maps. Even though a lender may contract out the determination requirement, it still bears the responsibility for the accuracy of the determination. Consequently, the lender has a high level of interest in a flood map's readability. Disputes often develop over the location of a property, and proper determinations affect a lender's compliance rating with its regulating agency. Further, a lender needs to be aware of the risk to loss of properties accepted as collateral on loans. Although the lending industry always reserves the right to require insurance in the kinds and amounts thought necessary to protect the loan, the industry has followed the government's lead in requiring insurance only on properties determined to be in an SFHA.

Bank of America, as a representative of the lending industry, believes that the Council's work will result in changes to the maps and the mapping process so that a property's flood-zone status can be determined more easily, and that the maps will reflect more accurately and consistently a

property's real potential of loss due to flood. Finally, the lending industry wants to see a more efficient and accessible means of obtaining flood-zone status information.

6.2.6 Fannie Mae

Internet: www.fanniemae.com

The Organization. Fannie Mae is a congressionally chartered, shareholder-owned company and the nation's largest source of home mortgage funds. At Fannie Mae we are in the American Dream business. Our mission is to tear down barriers, lower costs, and increase the opportunities for homeownership and affordable rental housing for all Americans, because having a safe place to call home strengthens families, communities, and our nation as a whole. As a leader in the secondary market, Fannie Mae purchases residential home loans from local mortgage lending institutions—the primary market—thus replenishing its supply of mortgage funds available for lending. Fannie Mae purchases for its own portfolio or holds in trust for investors more than one out of every five mortgages originating in the United States.

Fannie Mae purchases mortgage loans from approved seller/services. Service of the loan is provided in accordance with standards promulgated in Fannie Mae's selling and servicing guides. These guides detail Fannie Mae's requirements for determining the flood-zone status of a property at origination, obtaining and maintaining an acceptable flood insurance policy, and monitoring the status of the property to ensure that flood risk is properly identified throughout the life of the mortgage. Fannie Mae also has statutory obligations with respect to requiring flood insurance; therefore, its standards are shaped in part by its obligations as defined in flood-related legislation.

Fannie Mae has partnered with FEMA to rollout a unique pilot for Florida Homeowners. As part of FEMA's disaster preparedness *Project Impact* initiative, this pilot will help participants secure the necessary financing at competitive interest rates to complete hurricane disaster upgrades in their homes. Upgrades available include strapping down the foundation, reinforcing the roof and chimney, and installing special hurricane shutters. A network of certified contractors will make all improvements. The loans will be originated by a Fannie Mae-approved specialty third-party originator and serviced by a Fannie Mae-approved loan servicer. Our initial *Project Impact* loan pilot was announced by Vice President Al Gore in Deerfield Beach, Florida on August 7, 1998. In 1999, FEMA continued to work with Fannie Mae to roll out related *Project Impact* initiatives in other areas of the country vulnerable to natural disasters, such as massive flooding, tornadoes, and earthquakes.

Mapping Concerns. As an investor in home mortgages, Fannie Mae is concerned about the quality of the mortgages. This concern includes ensuring that mortgage assets are properly protected against hazards, including flooding. It is concerned, therefore, that flood maps provide an accurate means for easily ascertaining the flood insurance risk of a designated property. Further, the mortgage loan process is becoming increasingly automated. The time required to apply for, underwrite, and close a mortgage loan has shrunk in some cases from weeks to days. The mortgage industry must be able to rely on flood maps that are consistent with the faster, more streamlined mortgage process.

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In summary, Fannie Mae believes the flood mapping process should result in FIRMs that are easily accessible to the lending industry, very accurate with respect to determining and depicting the flood hazard area (flood boundary), and easy to interpret.

6.2.7 Federal Emergency Management Agency

Internet: www.fema.gov

The Organization. FEMA's mission is to provide leadership and support to reduce the loss of life and property and protect the nation from all types of hazards. It is a 2,500-person agency supplemented by over 5,000 stand-by disaster reservists. FEMA provides preparedness and response and recovery support to the nation and, through its *Project Impact: Building Disaster Resistant Communities* initiative and other mitigation activities, provides leadership in preventing and reducing risk before disaster strikes. By taking action before disaster strikes, FEMA hopes to reduce the amount of federal money spent on picking up the pieces after a disaster and hopes to reduce the risks for property loss and loss of life that every state faces.

Mitigation is defined as "sustained action that reduces or eliminates long-term risk to people and property from natural hazards and their effects." It describes the ongoing efforts at the federal, state, local, and individual levels to lessen the impact of disasters upon our families, homes, communities and economy. Mitigation is the cornerstone of emergency management. FEMA's Mitigation Directorate is dedicated to increasing the public's awareness of their risks, providing guidance to build more safely, and outreaching to others to spread the word about mitigation successes. Mitigation involves keeping homes away from floodplains, engineering bridges to withstand earthquakes, creating and enforcing effective building codes to protect property from hurricanes—and much more.

Through the application of mitigation technologies and practices, our society can ensure that fewer Americans and their communities become victims of natural disasters. For example, mitigation measures can be applied to strengthen homes, so that families and personal belongings are better protected from floods, earthquakes, hurricanes, and other natural hazards. They can be utilized to help business and industry avoid damages to their facilities and remain operational in the face of catastrophe. Mitigation technologies can be used to strengthen hospitals, fire stations, and other critical service facilities so that they can remain operational or reopen more quickly after an event. In addition, mitigation measures can help reduce disaster losses and suffering so that there is less demand for money and resources in the aftermath.

Mapping Concerns. FEMA administers the NFIP, a federal program enabling property owners in participating communities to purchase insurance protection against losses from flooding. This protection is designed to provide an insurance alternative to disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods. Participation in the NFIP is based on an agreement between local communities and the federal government that states if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in Special Flood Hazard Areas, the federal government will make flood insurance available within the community as a financial protection against flood losses.

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For decades, the national response to flood disasters was generally limited to constructing flood-control works such as dams, levees, seawalls, and the like, and providing disaster relief to flood victims. This approach did not reduce losses, nor did it discourage unwise development. In some instances, it may have actually encouraged additional development. To compound the problem, the public generally could not buy flood coverage from insurance companies, and building techniques to reduce flood damage were often overlooked. In the face of mounting flood losses and escalating costs of disaster relief to the general taxpayers, the U.S. Congress created the NFIP. The intent was to reduce future flood damage through community floodplain management ordinances, and provide protection for property owners against potential losses through an insurance mechanism that requires a premium to be paid for the protection.

Since the 1970s, FEMA's Technical Services Division, within the Mitigation Directorate has been responsible for creating, updating, maintaining, and storing flood hazard maps for the NFIP communities across the United States. Over the same time period, there has been a computer revolution—from mainframes to personal computers to local area networks to the Internet. Advancements in hardware and software have enabled a mapping revolution—from manual cartography to computer-aided design to Geographic Information Systems to real-time high-resolution digital satellite imagery.

FEMA maintains warehouses of paper maps, flood profiles, Letters of Map Change, and other hardcopy data supporting the day-to-day work of the NFIP. Through our Map Modernization Plan, we plan to take advantage of technology to automate these products where possible, especially in the development of future mapping products. As we move toward the next century, our goal is to work cooperatively with our federal, state, and local partners to bring greater flexibility, access, accuracy, and efficiency to the process of creating and disseminating flood hazard maps.

6.2.8 Freddie Mac

Internet: www.freddiemac.com

The Organization. Freddie Mac is a stockholder-owned corporation chartered by Congress in 1970 to create a continuous flow of funds to mortgage lenders. By purchasing mortgages from primary lenders for its portfolio or to package into securities that are sold to investors, Freddie Mac sustains a stable mortgage credit system and reduces the mortgage rates paid by homebuyers. Over the years, Freddie Mac has opened doors for one in six American homebuyers and two million renters across America.

Mapping Concerns. If the insurable improvements on a property securing a mortgage originated for sale to Freddie Mac or serviced for Freddie Mac are determined to be in a Special Flood Hazard Area (SFHA), Freddie Mac requires that the borrower maintain flood insurance on such improvements. The financial institutions that originate residential mortgages for sale to Freddie Mac or service mortgages for Freddie Mac, or the professional flood zone determination firms with which these institutions contract, must use FEMA's flood maps (Flood Hazard Boundary Maps or Flood Insurance Rate Maps) to determine whether the improvements on a mortgaged property are in an SFHA. Thus, although Freddie Mac does not use FEMA's flood maps, its

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interests would be affected if the assessment of its collateral's exposure to flood risks were based on maps the integrity of which is subject to challenge. Freddie Mac's participation in the Council is mandated by the NFIRA.

6.2.9 National Flood Determination Association

The Organization. The organization is comprised of flood determination firms that have strong technical expertise and extensive experience with mapping products and FEMA processes. It is committed to developing a code of ethics and a set of standards for the industry as a whole, and to the application of computer technology in producing and distributing accurate and timely map products. National Flood Determination Association (NFDA) membership includes land surveyors, engineers, geographers, other technically oriented professionals, and businesspersons whose primary livelihood depends on the success of the NFIP. Their representation on the Council offers policymakers the viewpoints of FEMA map customers who have a major stake in supporting the Council in accomplishing its mission.

The flood determination industry came into being because lenders and others were finding it difficult to interpret the NFIP regulations, to obtain and read the FIRMs, and to obtain accurate community status information. For a modest fee, association members relieve their clients of this burden and provide determinations for properties to be mortgaged. Members also operate a monitoring service, known as “life-of-loan tracking,” to supply updated information to lenders. The service notifies its users of changes in flood insurance requirements for the loans in their portfolios.

Mapping Concerns. NFDA members read maps and give out information daily. Because of their intensive usage of the maps, they probably are more aware than many other users of inaccuracies, particularly in older maps, that leave properties at risk outside of flood zones or show well-elevated properties within them. Since the organization's beginning, it has provided information to FEMA on the inaccuracies that become apparent. Members also have noted mistakes, such as streets improperly named or areas left out of the mapping process. NFDA also finds that the Community Status list is often in error—an understandable situation considering the mammoth undertaking of mapping the entire United States and its territories.

NFDA members also are acutely conscious of the need for timely distribution of maps, LOMAs and LOMRs, and other mapping products.

The advent of newer technology, including more powerful computer systems and sophisticated software, offers an opportunity for flood-zone vendors to develop databases and interactive processes to provide information for their clients. The research effort that many NFDA members have expended in developing these systems gives them a unique understanding of the challenges that FEMA faces in producing new products and in updating old and inaccurate information.

6.2.10 National Geodetic Survey

Internet: www.ngs.noaa.gov

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The Organization: The National Geodetic Survey (NGS) is an office within the National Ocean Service, which is a subset of the National Oceanic and Atmospheric Administration (NOAA), a bureau within the United States Department of Commerce.

The NGS Mission: To deliver and evolve the nation's foundation of reference for latitude, longitude, height, velocity, shoreline, and gravity throughout the United States with consistency, accuracy, timeliness, currency, and easy access to support public safety, coastal stewardship, economic prosperity, and environmental well-being. In order to meet the nation's navigation and other positioning needs, the existing coordinate reference system is being renovated to provide the higher accuracy and greater accessibility needed for use with the GPS. The digital revolution in mapping, charting, navigation, and surveying requires a National Spatial Reference System (NSRS) consisting of the following components:

- a network of monumented points having four-dimensional positions;
- a set of GPS Continuously Operating Reference Stations (CORS);
- high accuracy orbits of the GPS satellites;
- a highly accurate geoid model (a representation of the earth's gravity field); and
- a consistent, accurate, and up-to-date national shoreline.

Activities and Potential Benefits: NGS is integrating these components into this evolving unified national positioning system, joined and maintained by GPS, and setting the stage for many advances. Some of the potential benefits this innovative NSRS can provide are:

- improved marine navigation aids, such as docking charts, accurate under-keel clearance information, and real-time current, tide, water level, and sea-state data in the shipping channel;
- improved aeronautical navigation aids and safer aircraft approach and landing procedures;
- advanced surface transportation control and monitoring;
- increased efficiency in measuring crop yields, irrigation, and applications of fertilizers and pesticides mitigating non-point water pollution;
- improved crustal motion monitoring, disaster preparedness, and response;
- increases in efficiency and accuracy of three-dimensional positioning for surveying, mapping, and navigation;
- an accurate, consistent, and up-to-date national shoreline providing a smooth transition between the ocean and land interface for more accurate modeling of flooding, storm surges, and pollution trajectories; and
- increased accuracy and reliability of data layers in GIS for better informed decision making that helps resource management and mitigation natural disasters such as flooding.

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Mapping Concerns. The Federal Emergency Management Agency (FEMA) estimates that the federally backed flood insurance it provides to residents in more than 18,000 communities saves more than one-half billion dollars a year. The savings are due to the requirement that communities eligible for the insurance agree to restrict building in areas prone to flooding damage. With such a large financial stake involved, NGS standards for positioning, data submission, and archiving should be made mandatory for all flood-rate mapping. In the future, FIRMs produced by FEMA should be based exclusively on NGS-certified elevation control. The payoff can be significant, as demonstrated by homeowners along the Mississippi River near New Orleans in Jefferson Parish, where flood insurance rates were reduced by ten percent as a result of the parish's use of a GIS based on consistent coordinates established by NGS.

6.2.11 U.S. Geological Survey

Internet: www.usgs.gov

The Organization. The mission of the U.S. Geological Survey (USGS) is to provide to the nation reliable, impartial information to describe and understand the Earth. This information is used to minimize loss of life and property from natural disasters. Toward this end, the USGS has worked cooperatively with FEMA on several aspects of the National Flood Insurance Program. The USGS Water Resources Division collaborates with FEMA on hydrologic modeling research, provides flood frequency statistics, maintains a national stream-gaging network which provides critical information to the NFIP and works with FEMA to provide technical expertise as needed. The USGS National Mapping Division provides the base map for many FEMA flood-mapping products, and assisted FEMA in developing digital flood-mapping products, which are distributed in the USGS Digital Line Graph format. Recently, FEMA has participated in National Digital Orthophoto Program Steering Committee meetings. This committee guides the program resulting in the production and dissemination of USGS Digital Orthophoto Quarter Quadrangles (DOQs). In addition, the USGS and FEMA are participating in the formation of a similar consortium of federal agencies to assess the technical and budgetary requirements and specifications for nationwide, high-resolution, digital elevation data

Mapping Concerns. The U.S. Geological Survey representative on the Council (Kari Craun) provides technical expertise related to the development of digital map data standards consistent with those developed through the Federal Geographic Data Committee and seeks areas of commonality between the mission of the USGS and the National Mapping Program and that of the NFIP. The mission of the USGS, National Mapping Program, is "To meet the nation's need for basic geospatial data, ensuring access to and advancing the application of these data and other related earth science information for users worldwide." By participating on the Council, the USGS hopes to provide assistance to FEMA in ensuring the availability and access to floodplain data and associated base geospatial data. The USGS representative also provides a link to the FGDC Subcommittee on Base Cartographic Data, chaired by the USGS, and to the technical expertise in the USGS Water Resources Division on an as-needed basis to assist the Council on hydrologic issues.

6.3 Acronyms

AASG	Association of American State Geologists
ACSM	American Congress on Surveying and Mapping
ASCE	American Society of Civil Engineers
ASFPM	Association of State Floodplain Managers
BFE	Base Flood Elevation
CBRS	Coastal Barrier Resource System
CLOMR	Conditional Letter of Map Revision
CRS	Community Rating System
CTC	Cooperating Technical Community
DOQ	Digital Orthophoto Quadrangle
DEM	Digital Elevation Model
DFIRM	Digital Flood Insurance Rate Map
DTM	Digital Terrain Model
ERM	Elevation Reference Mark (or Monument)
Fannie Mae	formerly, Federal National Mortgage Association
FERC	Federal Energy Regulatory Commission
FEMA	Federal Emergency Management Agency
FGDC	Federal Geographic Data Committee
FIA	Federal Insurance Administration
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
FISCAA	Flood Insurance Servicing Companies Association of America
Freddie Mac	formerly, Federal Home Loan Mortgage Corporation
GIS	Geographic Information System
GPS	Global Positioning System
IFSAR	Interferometric Synthetic Aperture Radar
LIDAR	Light Detection and Ranging
LODR	Letter of Determination Review
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision based on Fill
MCC	Map Coordination Contractor
MICS	Monitoring Information on Contracted Studies

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MMP	Map Modernization Plan; published as: <i>Modernizing FEMA's Flood Hazard Mapping</i> , November 1997
MNUSS	Mapping Needs Update Support System
MSC	Map Service Center
NAFSMA	National Association of Flood and Stormwater Management Agencies
NEMA	National Emergency Management Association
NFDA	National Flood Determination Association
NFIP	National Flood Insurance Program
NFIRA	National Flood Insurance Reform Act of 1994
NGDC	National Geographic Data Committee
NGS	National Geodetic Survey
NDOP	National Digital Orthophoto Partnership
NOAA	National Oceanic and Atmospheric Administration
NSDI	National Spatial Data Infrastructure
NSRS	National Spatial Reference System
PPS	Precise Positioning Service
SC	Study Contractor
SFHA	Special Flood Hazard Area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

6.4 Flood Zone Descriptions

Zone	Description	Flood Insurance Required
A	Areas subject to inundation by a 100-year (1%-annual-chance) flood. Because detailed hydraulic analyses have not been performed, no base flood elevation or depths are shown.	X
AE	Areas subject to inundation by a 100-year flood as determined by detailed methods. Base flood elevations are shown within these zones (zone AE is used on new and revised maps in lieu of zones A1-A30).	X
AH	Areas subject to inundation by 100-year shallow flooding (usually areas of ponding) where average depths are between one and	X

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	three feet. Base flood elevations derived from detailed hydraulic analyses are shown in this zone.	
AO	Areas subject to inundation by 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between one and three feet. Average flood depths derived from detailed hydraulic analyses are shown within this zone.	X
AR	Area of special flood hazard that resulted from the decertification of a flood-protection system that is in the process of being restored.	
A1-A30	Areas subject to inundation by a 100-year flood as determined by detailed methods. Base flood elevations are shown within these zones (zone AE is used on new and revised maps in place of zones A1-A30).	X
A99	Special Flood Hazard Areas subject to inundation by a 100-year flood but that ultimately will be protected by a federal flood-protection system that is being constructed. Flood-protection systems in this zone include dikes, dams, and levees on which construction progress meets statutory provisions for considering the system complete for insurance rating purposes. No base flood elevations or depths are shown.	X
B	Areas of moderate or minimal hazard from the principal source of flooding in the area, as identified in the community Flood Insurance Study (FIS). Buildings in these zones, however, could be flooded by severe, concentrated rainfall where local drainage systems were inadequate. Local stormwater drainage systems are not normally considered in the community's FIS. The failure of a local drainage system creates areas of high flood risk within zone B. Flood insurance is available in participating communities but is not required by regulation (zone X is used on new and revised maps in place of zones B and C).	
C	Areas of moderate or minimal hazard from the principal source of flooding in the area, as identified in the community FIS. Buildings in zone C, however, could be flooded by severe, concentrated rainfall where local drainage systems were inadequate. Local stormwater drainage systems are not normally considered in the community's FIS. The failure of a local drainage system creates areas of high flood risk within zone C. Flood insurance is available in participating communities but is not required by regulation (zone	

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	X is used on new and revised maps in place of zones B and C).	
D	Unstudied areas in which flood hazards are undetermined but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.	
V	Coastal areas subject to inundation by a 100-year flood having additional hazards associated with storm-induced waves. Because detailed hydraulic analyses have not been performed, no base flood elevations or depths are shown.	X
VE	Coastal areas subject to inundation by a 100-year flood having additional hazards due to storm-induced velocity wave action. Base flood elevations derived from detailed hydraulic analyses are shown within these zones (zone VE is used on new and revised maps in lieu of zones V1-V30).	X
V1-V30	Coastal areas subject to inundation by a 100-year flood having additional hazards due to storm-induced velocity wave action. Base flood elevations derived from detailed hydraulic analyses are shown within these zones (zone VE is used on new and revised maps in lieu of zones V1-V30).	X
X	Areas of moderate or minimal hazard from the principal source of flooding in the area as identified in the community FIS. Buildings in these zones, however, could be flooded by severe, concentrated rainfall where local drainage systems were inadequate. Local stormwater drainage systems are not normally considered in the community's FIS. The failure of a local drainage system creates areas of high flood risk within zone X. Flood insurance is available in participating communities but is not required by regulation (zone X is used on new and revised maps in lieu of zones B and C).	
<p>Source: FEMA, <i>Answers to Questions about the National Flood Insurance Program</i>, November 1997.</p>		