



FEMA

October 17, 2007

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MEMORANDUM FOR: Regional Mitigation Division Directors
Regions I - X

A handwritten signature in black ink, appearing to read "Doug Bellomo".

FROM: Doug Bellomo, P.E., Director
Risk Analysis Division

SUBJECT: Revised Procedure Memorandum No. 38 – Implementation of
Floodplain Boundary Standard (Section 7 of MHIP V1.0)

EFFECTIVE FOR: All Digital Flood Insurance Rate Maps (DFIRMs) produced using
Flood Map Modernization Funding

Background: As part of Flood Map Modernization, FEMA is committed to delivering high-quality mapping products to its stakeholders using proven and reliable technologies. Section 7 of FEMA's November 2004 *Multi-Year Flood Hazard Identification Plan* (MHIP Version 1) discussed the methods of flood hazard data collection, analysis, and mapping appropriate for varying levels of risk. Most significantly, Section 7 presents a Floodplain Boundary Standard that must be met in order for a map to have reliable floodplain delineations (i.e. the computed flood elevation and the ground elevation at the mapped floodplain boundary match within a tolerance set for a flood risk class).

This standard (summarized in Table 7-1 of the November 2004 MHIP and reproduced with slight modifications below in Table 1) was developed through a series of meetings in the summer and fall of 2004 involving FEMA Regional and Headquarters staff, as well as floodplain management officials at various levels of government (state, local, and multi-jurisdictional) in response to stakeholder concerns that simply digitizing existing maps will not result in reliable products in many instances.

As a result of the Map Modernization mid-course adjustment, FEMA issued the Flood Map Modernization 2006 Congressional Report in February 2006 which clarified the definition of a modernized map and introduced a new goal for compliance with the Floodplain Boundary Standard. A modernized map means a map product that meets the requirements outlined in the *Guidelines and Specifications for Flood Hazard Mapping Partners* and a geospatial dataset is available online. The new goal for complying with the Floodplain Boundary Standard is defined as 75 percent of mapped stream and coastal miles meeting the 2005 Floodplain Boundary Standard (hereafter referred to as Congressional Goal 2).

The purpose of this revised memorandum is to 1) rescind the requirement that a map must meet the Floodplain Boundary Standard in order to be counted toward Map Modernization Key Performance Indicator 1 (KPI1), 2) incorporate revised guidance for the implementation of the Floodplain Boundary Standard as a result of the Map Modernization mid-course adjustment, 3) update Table 1 FBS criteria, and 4) release an updated version of the Floodplain Boundary Standard Audit Procedures. KPI1 is defined as the percentage of population with digital GIS flood data available online.

Table 1. Floodplain Boundary Standard for Flood Insurance Rate Maps

		Delineation Reliability of the floodplain per study methodology ¹	
Risk Class	Characteristics	Detailed	Approximate ²
A	High population and densities within the floodplain, and/or high anticipated growth	+/- 1.0 foot/ 95%	+/- 1/2 contour 95%
B	Medium population and densities within the floodplain, and/or modest anticipated growth	+/- 1.0 foot/ 90%	+/- 1/2 contour 90%
C	Low population and densities within the floodplain, small or no anticipated growth	+/- 1.0 foot/ 85%	+/- 1/2 contour 85%
D	Undetermined Risk, likely subject to flooding	NA	NA
E	Minimal risk of flooding; area not studied	NA	NA

¹The difference between the ground elevation (defined from topographic data) and the computed flood elevation.

² For Approximate studies the vertical tolerance should be +/- 1/2 contour or 1.0 ft which ever is greater.

Vertical accuracy requirements specified in Table 1 can be achieved within a horizontal accuracy of +/- 38 feet for each risk class. The horizontal tolerance addresses varying floodplain delineation techniques (automated versus non-automated) and map scale limitations.

Issue: The reliability of the floodplain boundary delineation is quantified by comparing the computed flood elevation to the ground elevation at the mapped floodplain boundary. This standard will be applied equally to all maps produced using map modernization funding. The tolerance for how precisely the flood elevation and the ground elevation must match varies based on its flood risk class, which is a function of population, population density, and/or anticipated growth in floodplain areas. The characteristics stated in Table 1 serve as a general reference for categorizing flood risk. FEMA Regions should work with their respective mapping partners during the planning and scoping phase to determine the appropriate risk class for each studied flooding source.

The higher the risk class, the more precisely the flood elevation and the ground elevation at the mapped floodplain boundary must match. For example, in Risk Class A, for 95% of the detailed flood hazard points checked, the difference between the flood elevation and the ground elevation at the mapped floodplain boundary need to be within ± 1.0 foot in order to meet the Floodplain Boundary Standard.

For clarification purposes, a modernized map means a map product that meets the requirements outlined in the *Guidelines and Specifications for Flood Hazard Mapping Partners* and a geospatial dataset is available online. The Floodplain Boundary Standard provided in Table 1 is used to track the number of coastal / stream miles that meet that particular standard (2006 Congressional Goal 2). The auditing process to determine when products meet the Floodplain Boundary Standard is outlined in Figure 1.

Action Taken: All DFIRMs contracted following the issuance of the original September 2, 2005 Procedure Memorandum in FY05 and subsequent years must meet the Floodplain Boundary Standard specified in Table 1 and provide self-certification documentation reflecting the DFIRM's adherence to the standard. The attachment to this memorandum identifies FEMA's plan for moving forward with the implementation of this standard.

DFIRMs contracted after the issuance of the original September 2, 2005 Procedure Memorandum are in compliance with the Floodplain Boundary Standard if either of the two following conditions occurs:

- A signed statement from the mapping partner, including Attachment B documentation from the Floodplain Boundary Standard Audit Procedures, stating delivered flood map products are in compliance (i.e. self-certification)

OR

- An audit does not uncover deficiencies

For DFIRMs contracted prior to the issuance of the original September 2, 2005 Procedure Memorandum, the attachment to this memorandum describes the process that will be used to determine compliance with the Floodplain Boundary Standard.

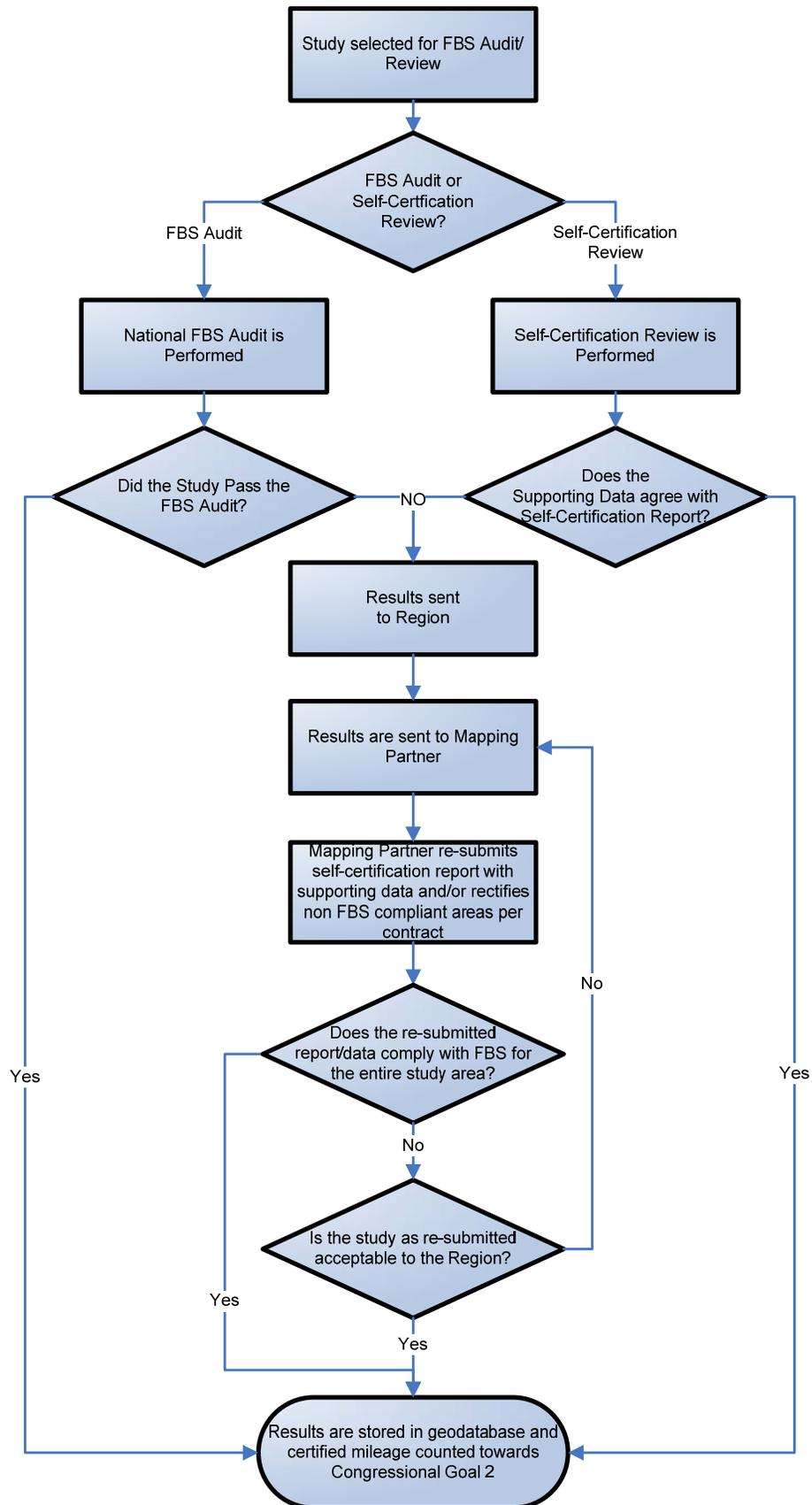
Furthermore a periodic audit of the mapping partner's projects will be conducted to ensure consistency of the self-certification process and compliance with the Floodplain Boundary Standard. If the entire study cannot meet the Floodplain Boundary Standard as specified in Table 1, self-certification documentation, which is a required deliverable for every project, must be submitted on a sub-basin level. The updated Floodplain Boundary Standard Audit Procedures, version 2.0, provides guidance on the audit process and documentation needed for Floodplain Boundary Standard compliance through self-certification. Self-certification documentation must be submitted to FEMA:

- Within 30 days of the issuance of a study Preliminary, and
- Within 30 days of the issuance of a study's Letter of Final Determination (LFD) if the floodplain boundaries have been modified during the post-preliminary processing of that study.

Meeting the vertical standard specified in Table 1 within the horizontal tolerance provided constitutes 100% compliance with the Floodplain Boundary Standard. Maps selected for audit will proceed forward through the flood map production and adoption process as the audits are conducted.

cc: See Distribution List

Figure 1. Auditing Process



Distribution List (electronic distribution only)

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Attachment – Floodplain Boundary Standard Implementation

Background

Flood Map Modernization projects will result in digital FIRMs compliant with the Guidelines and Specifications in place at the time of study initiation. However, these projects are subject to possible audit against the Floodplain Boundary Standard outlined in this memorandum.

Projects initiated following the issuance of the original September 2, 2005 Procedure Memorandum and subsequent years are required to meet the Floodplain Boundary Standard (FBS) provided in Table 1. Thus, it is important that compliance with this standard be planned for during project scoping and tasking phase.

Although mapping partners are required to provide FBS self-certification documentation for all projects and should understand that these projects are subject to a possible audit, it is expected that products produced using the following methods, have a high probability of complying with Floodplain Boundary Standard:

- DFIRMs are created and floodplain boundaries are delineated/redelineated using automated mapping techniques;
- DFIRMs are created by compiling floodplain boundaries with digital topography; or
- DFIRMs are created by digitizing floodplain boundaries from a topographic map that meets horizontal map accuracy standards for base maps.

Selection and Process for Audit

Two types of audits will be performed:

1. A FBS-Self Certification Review, which entails a review of the self-certification documentation, and/or a
2. National FBS Audit, which will subject the DFIRM data to the GIS-based audit methodology defined in the FBS Audit Procedures.

Maps will be audited either before they are issued preliminary or after they go effective. They will not be audited during the post-preliminary period prior to the effective date of the new maps. The topographic data used by the mapping partners to create the DFIRM will be used for the audit unless that topographic data is no longer available. If the source topographic data is not available or cannot be determined, then the DFIRM will not be audited. These flooding sources will be considered non-compliant in their entirety with the Floodplain Boundary Standard unless documentation from the FEMA Regional Office indicates that redelineation of the floodplain boundary onto available topographic data would degrade the quality of the delineation. Receipt of this documentation from the FEMA Regional Office would serve as compliance with the Floodplain Boundary Standard.

The results of all audits performed (pass or fail) will be provided first to the FEMA Regional office and then the mapping partner at the direction of the FEMA Region. In the event a particular study fails the audit, the mapping partner will be given the opportunity to review and respond to the audit results. There are a variety of legitimate reasons a particular project may fail to meet the Floodplain Boundary Standard and the mapping partner will be given ample opportunity to provide justification. Copies of the justifications must be provided to the auditor, FEMA Headquarters, and the FEMA

Regional office. The FEMA Regional office will be the final adjudicator of all justifications submitted. If the justifications are found to be acceptable (by the Region), the flood boundaries in question would be considered passing the Floodplain Boundary Standard audit and counted towards Congressional Goal 2. Examples of potentially legitimate justifications are provided below:

1. Original topographic mapping used to prepare the effective FIS and FIRM could not be found but, as documented in the FIS, it was of better detail and accuracy than the data used to run the check AND that making the boundaries fit the ground elevation data used in the check would result in a less reliable product. [This assumes that the original topographic map was used to redelineate the boundary and not just digitize the effective FIRM. Since FEMA’s legacy inventory (FIRMs effective prior to FY 2003) is not horizontally set to a coordinate system, many of the boundaries were forced within a small local area for “relative” accuracy.]
2. An existing feature not reflected in the topographic data was taken into account when preparing the mapped floodplain boundary.

Mapping projects that fail the audit will not be considered meeting the Floodplain Boundary Standard but the stream miles that meet the standard will count towards Congressional Goal 2. For such projects, FEMA will work with the state, communities, and the mapping partner to determine the appropriate course of action for the project, such as initiating a new flood map update or leaving the product “as is” until a later date. Factors to consider when making this decision might include community and state desires, availability of resources, capitalizing on the utility of the product, impact on the Congressional Goal 2, timeliness of audit in relation to the effective date, relative flood risk and others.

Studies Not Contracted to Meet the Standard

All maps produced using Map Modernization funding, including studies funded prior to FY2005 will be subject to audit against this standard. For any projects not tasked to meet the standard, the FEMA Region will work with the mapping partner to assess the impact on scope, schedule, and cost of meeting the standard. The FEMA Region will then decide whether or not to revise the task order, Mapping Activity Statement, or Inter-Agency Agreement to meet (and incorporate by reference) the Floodplain Boundary Standard provided in Table 1. If that is deemed not feasible, the FEMA Region will decide whether or not to defer the project. Despite contractual obligations, all maps produced using Map Modernization funding are subject to testing against this standard. Failure to meet the standard is not necessarily violations in contract requirements.

For studies that are contracted prior to FY2005 that are not audited, the following compliance levels with the Floodplain Boundary Standard will be applied to the following levels of study.

Level of Study	% Stream Mile FBS Compliance
Digital Conversion	35% detailed; 75% approximate
Redelineation	100%
New Detailed study	100%

These compliance levels were determined through a series of internal audits of pre-FY05 contracted studies by FEMA Headquarters and tested against the criteria provided in Table 1. However, if the FEMA Regional Office has documentation that provides more detail for a particular level of study or

project than the compliance levels listed above, then this information will be utilized to calculate percent compliance with the Floodplain Boundary Standard.

Implementation for New Studies

The following process is required for new study starts beginning in FY 2005 to ensure compliance with the standard. Some exceptions may be allowed by FEMA.

1. **DETERMINE THE RISK CLASS UPFRONT.** Determine the risk class of the study areas, with input from state and local officials. The risk class, which can be based on the factors such as county decile, population growth data, and repetitive losses, at risk infrastructure, can vary within each and/or different flooding sources within a study area (usually a county). The risk classifications should be agreed to by the community, state, and the FEMA Region during project scoping. FEMA makes the final determination of risk classes in cases of dispute. Identifying the topographic data sources to be used for study should also be performed at this step.
2. **DETERMINE ADEQUACY OF LEVEL OF STUDY.** Determine whether or not the level of study (e.g., detailed, approximate, unstudied) on the effective map is appropriate for the risk class. If so, proceed to step 3. If not, develop new study/restudy and develop floodplain boundaries that comply with Table 1 standard for the risk class. Floodplain boundaries must be delineated using topographic/terrain data that meet existing FEMA standards. If funds do not allow for development of new study/restudy, FEMA, in conjunction with state and local officials, will decide whether or not to proceed with the project or defer new engineering. Deferred projects will be captured as a community map in a geospatial database.
3. **DETERMINE APPROPRIATE METHOD FOR MAPPING NON-REVISED FLOODPLAINS.** For flooding sources not being newly studied or restudied, mapping partners should not be predisposed to simply transfer the boundaries from the existing FIRM to the new map. Rather, the mapping partner must make an earnest effort to upgrade the floodplain boundaries utilizing available resources. The three types of redelineation, listed below in preferred order of use, are:

Case 1: Revised Topographic Delineation: Conduct research to determine if topographic/terrain data is available from the state, community, or other source that is of better quality than that used to prepare the effective FIS and FIRM. Topographic data is considered of better quality if it is of greater vertical accuracy, is more recent than that used to prepare the effective FIRM, and meets FEMA's standards for topographic data. If higher quality topographic/terrain data is available, it should be obtained and used to redelineate the floodplain boundaries using the effective FIS and/or published flood profiles.

Case 2: Work-Map Based: If topographic data of better quality is not available, conduct research to determine if the original work maps are available from the FEMA library maintained by the National Service Provider or the state or community. If available, these work maps, which typically include detailed topographic strip mapping along the flooding source, should be used to digitize the floodplain boundaries and cross sections.

Case 3: FIRM-Based: If neither better or equivalent quality topographic data and/or the

original work maps are not available and there is documentation that indicates that redelineation of the floodplain boundary onto available topographic data would degrade the quality of the delineation, the effective floodplains may be fit to the new base map features. In this case the mapping partner must prepare a signed document denoting the quality of the best available topographic and the quality of the topographic data that the effective boundaries have been delineated against and why the neither are being utilized to redelinate this particular study. FIRM-based method requires prior approval from the FEMA Region.

Many projects will entail a combination of the above techniques. That is, some flooding sources will be newly studied or restudied, while others will involve transferring effective FIS information to the new maps. Additionally, the risk class may vary by flooding source or reach of the flooding source and thus, the floodplain reliability requirement will vary according to Table 1.

For mapping projects contractually tasked to meet the Floodplain Boundary Standard outlined in Table 1, a mapping partner's signature on the Technical Support Data Notebook and self-certification report as referenced in Attachment B of the Floodplain Boundary Standard Audit Procedures will mean (among other things) that the floodplain boundaries comply with the Floodplain Boundary Standard. Audit and self-certification procedures are made available to all mapping partners that use an automated process as well as a non-automated GIS based procedure to allow each mapping partner to check the quality of their floodplain boundary delineation. Consequently, the mapping partner should check as many points and flooding sources as they deem necessary in order to feel comfortable attesting to the floodplain boundary quality for all flood hazards in their study area. Further, areas found to fail the test can be referred to the local government for a ground truth assessment or concurrence that failed areas do not pose flood risk to property and the public. If these assessments find the floodplain boundaries to be adequate (despite the audit result), the score will be revised to pass all points within the area assessed.