FEMA Risk MAP

Community Role in the Mapping Process

September 2025

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Acronyms

Base Flood Elevation (BFE)
Cooperating Technical Partners (CTP)
Flood Insurance Rate Maps (FIRM)
Flood Insurance Study (FIS) profile
Flood Risk Report (FRR)
Letters of Map Amendment (LOMA)
Letters of Map Revision (LOMR)
Modeling, one-dimensional (1D)
Modeling, two-dimensional (2D)
National Flood Insurance Program (NFIP)
Special Flood Hazard Area (SFHA)
Technical support data notebook (TSDN)

Hyperlinks

Hyperlinks and web addresses were added in September 2025. They may have changed between then and when you are viewing this document. If a link is broken, search for the associated keywords online.

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Overview

This document is intended to give local community officials who work with flood hazard data (e.g., floodplain managers, planners, and engineers) an idea of questions they might want to ask Federal Emergency Management Agency (FEMA) and/or its Mapping Partner (e.g., CTP, contractor, etc.) throughout the FEMA Risk Mapping, Assessment and Planning (Risk MAP) process. It also outlines what to do with the information received and how to use it to manage development in the Special Flood Hazard Area (SFHA). The SFHA is the area on a FEMA Flood Insurance Rate Map (FIRM) that determines which structures are subject to floodplain regulations as well as where flood insurance is required.

Why your community is getting new flood risk maps

The Federal Emergency Management Agency routinely updates the Flood Insurance Rate Maps (FIRM) for communities. Updates are often needed due to new topographic data being available, increased development in the watershed, improving the representation of structures (bridges, culverts) and/or the need to upgrade the engineering modeling. In some cases, FEMA is converting hard copy maps to digital and/or providing base flood elevations (BFEs) where there are none presently available.

If your community has not had a map update in a while but has seen major development, reach out to your FEMA regional office to request a map update and/or to see if your community has been targeted for an update by FEMA. If your state or community is a Cooperating Technical Partner (CTP), the FEMA regional office may direct you to the Cooperating Technical Partner.

What to know going into the mapping process

While not intentional, FEMA and its Mapping Partner do not always provide communities with all the information needed to provide the right input at the proper time during the Risk MAP process. This is because they conduct this process multiple times a year while communities only go through the process once a decade, if that. They also have a lot to cover and often speak at a high-level using jargon and language unfamiliar to the community, rather than plain language or a level of detail that allows a community not familiar with the mapping process to understand the detail of what is being discussed. However, it is in the details that certain decisions are made that may affect the model and maps, and therefore, your community's floodplain management decision making for years to come. As mentioned above, this handout is a starting place to help you know which questions to ask as you work with FEMA and/or its Mapping Partner throughout the mapping process. It is not exhaustive but does provide a sound base with which to start.

As you enter the mapping process, make sure the right people from your community are at the table, such as staff whose departments will be subject to new flood insurance rate map. This list could include but is not limited to planning & permitting, building code, public works, and roadway officials, etc. If there are state or federal highways in the study area, consider asking them to be involved in data collection and map review.

If any tribal nations, special districts, or other governmental or quasi-governmental bodies are within the study area, consider how you might want or need to engage with them in planning or decision-making regarding management of waterways after the maps have been adopted.

It is ideal to engage community residents throughout the mapping process to guard against any unexpected surprises to property owners after map adoption that could have been avoided with clear communication ahead of time. See the How to Involve the Pubic in the Feedback Process section for ideas around public engagement.

FEMA Risk MAP Phases

- Modeling and Mapping
    - Phase 1: Discovery
        - Community Knowledge and Information Sharing
        - Discovery Meeting
    - Phase 2: Analysis & Mapping
        - Project Kickoff Meeting
        - Flood Risk Review Meeting
        - Draft Flood Maps Review Period
- Outreach and Adoption (not the focus of this document)
    - Phase 3: Preliminary Flood Map Release
    - Phase 4: Map Adoption

Note, Base Level Engineering and/or Lidar data collection can occur prior to Phase 1.

Hydrologic and Hydraulic Modeling

Hydrology and hydraulics (H&H) are core engineering disciplines used to develop the flood data for the National Flood Insurance Program (NFIP). FEMA uses these studies to create Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs), which define the Special Flood Hazard Area (SFHA), or the area at risk of being inundated by the base flood. To learn more about hydrology, hydraulics, and the modeling process, view this "Hydrology – Learning the Basics" webinar. Get involved as early as possible in the Risk MAP process, especially with the modeling!

Base Level Engineering

Base Level Engineering (BLE) is a type of H&H method in which flood risk information is developed using ground elevation data and modeling software. BLE focuses on unknown, unmodernized, and unmapped areas. A number of counties in the U.S. still have only hard copy FIRMs that were developed in the 1970s. BLE is conducted for entire watersheds, and has been widely used by FEMA in recent years to increase understanding of flood risk in unmapped or unnumbered map areas. A BLE study produces initial draft flood risk information for community review. If BLE is conducted within your watershed, FEMA or its Mapping Partner will meet with local communities to assess the flooding hazards in those communities and existing flood hazard mapping to determine how well the BLE mapping meets the needs of the community. Dialogue with the community helps determine where the BLE needs enhancement.

What questions to ask the modelers during Discovery

Discovery is when the Risk MAP project team sets out to learn as much as it can about your community's flood risk challenges and goals. You should be contacted by the Risk MAP project team ahead of your Discovery Meeting. They may request relevant data and information and ask for feedback on your community's flood risk challenges and concerns. If they do, you should share as much information and data as possible to make sure you get the most accurate maps possible. The below question series can be referred to during both the "community knowledge and information sharing" period and the Discovery Meeting.

Project Team

Question	Why it is important to ask
Who are the relevant parties and what are their roles?	It is important to know with whom you should be communicating, both at FEMA (e.g., the Regional Project Manager) and the Mapping Partner's organization. You will want names, titles, and contact information (e.g., phone, email, etc.). Exact contacts may change but knowing who you're working with at the outset can help you connect with anew project manager if a clear handoff is not received during the transition. Note, if there is a turnover in Mapping Partners, the mapping process can be delayed. This may mean that the Mapping Partner(s) may lose track of responses to requests for comments or ask for the same information multiple times. If you have a change in Mapping Partner, review the specifications and your previous requests with them.

Project Scope

Question	Why it is important to ask
What streams sections are going to be included in the remapping effort?	FEMA at times only prepares maps for the main channel and does not include tributaries. If your community has had major flooding on tributaries, it may want to ensure those tributaries are included in the mapping effort. There have also been instances where water sources have been removed due to development (e.g., a stream was relocated) but FEMA included them in their original locations and mapped them in SFHA on the preliminary FIRM, even though they no longer exist. Your community may want to ensure that no water sources that have been removed are included in the model. It is important to get a written statement of which streams and tributaries are included. After the model is developed, there may be a cost to the community to include additional tributaries.
What type of hydrologic and hydraulic modeling is going to be used for the study?	Engineering modeling is an analysis based on the physical characteristics of the body of water (e.g., river, stream, lake, coastline, etc.) being studied and used to estimate the flood elevations associated with various flood events. There are different types of modeling approaches that can be used for a flood engineering analysis – steady or unsteady flow, one-dimensional (1D) or two-dimensional (2D). Historically FEMA flood engineering studies were conducted using 1D steady flow modeling. More recently, unsteady flow modeling has become more common, in particular 2D unsteady. It is important for communities to understand the differences between 1D and 2D modeling should unsteady and/or 2D modeling be utilized. ASFPM's Understanding 1D vs. 2D handout provides a basic overview of the different approaches, but you should ask FEMA and its Mapping Partner(s) to describe the difference as well. They often require specialized software, significant computational resources, and a deeper understanding of grid-based hydraulics, including the interpretation of both depth and velocity outputs, which differs substantially from the cross-section-based approach of 1D models. If your community is set to receive a 2D model and does

What type of hydrologic and hydraulic modeling is going to be used for the study?, cont'd.	not have staff with hydrology and hydraulic modelling familiarity and experience running the models used in the study in its floodplain management department, it may want to hire a consultant. See the "When to engage and what to look for in a consultant" Section below.
Will the community be able to easily access the model when complete?	The majority of maps are developed using models available in the public domain. Very rarely, a proprietary model may be used. Verify that the model being used is in the public domain and/or is readily available to the community at no cost and is easy to access.
Will the community be able to amend the model after completion? If so, is there a protocol to follow?	If your community would like to add new development internally after the model and maps are complete, it is important to ask if that will be possible at the outset. FEMA's Letter of Map Amendment process will need to be used to properly ensure the model is the "regulatory" model. In addition, the new model may have to be properly referenced in the community's floodplain management ordinance.
Are hydraulic structures represented in the engineering analysis?	Some models ignore structures entirely. If FEMA or its Mapping Partner say the model does include structures, you will want to make sure they are accurately represented. See data selection section. Note, models that ignore structures entirely may result in flawed estimates of flood limits and risk. The community should request that hydraulic structures be included.
Will the engineering modeling provide flood elevations that can be used to establish elevations for new development in areas which will not have published BFEs?	Flood engineering studies can include engineering modeling that does not meet the rigor for publishing BFEs but can be provided to communities for the siting of new development. It is suggested that your community request that the model be available to the community to ensure new development is properly elevated.

Timeline

Question	Why it is important to ask
What is the schedule for the project?	It is important to know the schedule for the project as certain milestones mark a last chance to provide further data and/or feedback on the model and/or maps. The community should know what each step in the process is,

What is the schedule for the project?, cont'd.	who is part of each step from the FEMA or Mapping Partner side, who they should plan to engage from the community side, what the community needs to prepare (i.e., what is the drop-dead date is for any feedback, changes, or recommendations?), and when each step is slated to occur. Make sure you have actual, regularly updated dates for each meeting and phase. Note, the process typically takes 3-5 years, but may take longer.
What is the deadline for the community to provide more updated data and information?	Communities often do not realize the ramifications of certain interactions or meetings, and that not asking questions or providing feedback at a certain point means they have lost the opportunity for input. One key interaction during the Risk MAP process is one of the first communications the community receives from FEMA. It will typically be a letter notifying them of the modeling software that FEMA or its Mapping Partner plan to use as they develop the modeling and maps; FEMA may use the term "engineering data models" rather than software. After receiving this notification, the community has 30 days to consult with the FEMA on the appropriateness of the models selected for the project. The letter reads, "upon receipt of this letter, your community is given 30 days to consult with [Mapping Partner] regarding questions or comments on the appropriateness of the selected methodology." While your community will have additional opportunities to comment on and provide feedback about the models and other draft flood hazard information, this is the best time to make comments. Another example, a community interviewed by ASFPM said if FEMA and its Mapping Partner had made clear at an early meeting the data they were using was old lidar, the community would have said something but the information provided at the meeting by FEMA or its Mapping Partner was so high level with unfamiliar terminology that the community was never felt they had a real opportunity to provide feedback and let FEMA or its Mapping Partner know they wanted them to use more recent lidar they had collected.

What is the deadline for the community to provide more updated data and information?, cont'd.	Later in the process, new data is more difficult to incorporate and can slow the mapping process. Once the modeling is complete and the mapping process is underway, it is often difficult for engineers to incorporate new data. FEMA Mapping Partner often have contract deadlines that can prompt them to be reluctant to delay project completion to incorporate new data, and doing so can increase the total cost of the project. To ensure your community has the chance to course correct, make sure you ask the questions listed here at the outset, and confirm the answers throughout the process. This is especially important related to updated topographic and structural (e.g., bridge, culvert, dams, etc.) data.

Data Selection

Question	Why it is important to ask
How are hydraulic structures going to be incorporated into the modeling and mapping effort?	Structures (e.g., bridges, culverts, dams, etc.) may control the flow in a stream or river. Accurately representing the structure provides the best estimate of flood limits (i.e., extent, boundary, etc.) and impacts. FEMA and its Mapping Partner may have incomplete or old structural data, and the community may be aware of structures that have been upgraded. Structure data should be obtained from as-built plans or be measured in the field. Design plans may not accurately represent what was actually built. FEMA's or its Mapping Partner's scope may include surveying or collecting field-measurements of structures. Asking to see the survey plan could also help you identify where data gaps may exist. If your model does not have up-to-date structure information, the flood study may not adequately identify the flood risk, leading to incorrect base flood elevations. Communities should be prepared to provide the best data available on any structure that they have information for in the community. If state- or federally-owned or operated structures are in the study area, make sure they are included and accurately represented.

What flood flows will be used in the update process? Will new flood flows be developed? What flood flows will be used in the update process? Will new flood flows be developed?, cont'd.	FEMA and its Mapping Partner will typically use new flood flows when the new study utilizes 1D- or 2D-unsteady hydraulic models. In certain cases, such as when FEMA uses steady-state hydraulic analysis, FEMA or its Mapping Partner might update the engineering models but use flood flows from a previous study. If FEMA or its Mapping Partner are using old flood flows, make sure they understand any land cover or rainfall or stream gage data changes since the flood flows were developed. Understanding land use changes is especially important in areas that have been impacted by urbanization since the inception of the existing maps. The flood discharges are likely to be significantly underestimated, and flood storage capacity is likely to have changed. For example, in one community, FEMA mapped an area as agricultural that was formerly in agricultural production and has since been urbanized, which means the flood flows are no longer valid. The area's urbanization means it has a completely different hydrology. Similarly, if a major flood event has occurred since the flood flows were developed, understanding how rainfall and stream gage data changed from one event to the next via statistical analysis can inform whether the flood flows are still valid or not. If your community has stream gage data, ensure that data is known and made available to FEMA or its Mapping Partner. If it does not have stream gage data, USGS Regression Equations may be used. Historically, a confidence interval of 50% has been used in modeling and statistical analysis; ASFPM, however, recommends a higher confidence interval (e.g., 95%) be used.
What land cover data will be used?	As mentioned above, the type of land cover impacts the flood flow. It is important that FEMA or its Mapping Partner use the correct land cover information and data in the model or else the model and corresponding maps may not be accurate. You may also want to understand the correlation between the land cover data and roughness coefficients. Roughness coefficients represent the resistance to flow in channels and floodplains, meaning the higher the coefficient the slower the flow

What land cover data will be used?, cont'd.	(and the lower the coefficient the faster the flow.) Understanding how the land cover data was developed and what roughness coefficients were applied to each land cover type can help improve the consistency should the models be used for new development projects. Ask FEMA or its Mapping Partner for the look up table between land cover and roughness coefficients.
What topographic datasets will be used for the flood hazard mapping process?	Your community may have more up-to-date topographical data (e.g., Lidar) than FEMA or its Mapping Partner is aware of. Make sure FEMA or its Mapping Partner plan to use the most up-to-date and detailed data specific to your community. Also, ensure all topographic datasets used are based on the same vertical datum and, potentially, map projections (see glossary). Additionally, make sure FEMA or its Mapping Partner is aware of any areas that have been filled after the topographic data was collected (i.e., the community should double check that any Letters of Map Revision are set to be incorporated into the model, as FEMA or its Mapping Partner may not be aware of more recent LOMRs.)

Model Validation

Question	Why it is important to ask
How many events will be used to calibrate or validate the study?	Ideally, multiple events should be used to calibrate and validate an engineering analysis. With multiple events, patterns can be detected and confirmed. With only one event for comparison, it is harder but not impossible to validate findings.
What historic data will be used to validate the modeling developed for the project?	Flood engineering studies are estimates of flood heights. Using historic highwater marks, flood photos, and flood videos/drone footage help ensure the results match real world flood events. This improves community acceptance that the results are accurate. The community should provide FEMA or its Mapping Partner with information on historic flooding, including stream gauge and highwater mark data, to support the validation of the engineering modeling results.

	If available, the community should also share any georeferenced and dated flood photos or videos/drone footage that show historic flood height and could improve the accuracy of the flood study.

Model Platform/Software

Think about how you are going to administer development in the SFHA and the implications of the modeling on that process. The type of the modeling software used is important, as the community will likely need to be able to access and run the model at some point in the future when permitting development.

Question	Why it is important to ask
What engineering modeling software and version will be used for the study?	If a new version of the software is coming soon, you will want to understand the implications of having your model in outdated software. Will the longevity of the data and model be affected? Will you be able to adjust the model? As new versions of engineering software are developed, it is important to know how the version used will work with new versions. In addition, there are several different 2D modeling software packages available. A list of acceptable modeling software packages should be available on FEMA's website (https://www.fema.gov/flood-maps/products-tools/numerical-models). Make sure you will be able to easily access the software and run the model. For example, HEC-RAS 2D[1] is a widely used, public domain software that communities can access and learn to operate. Not all software packages are in the public domain, however, and same could be cost prohibitive. If a cost-prohibitive model is selected, ask for justification on why a public domain software is not a suitable software for the flooding source. For example, a community who recently got new maps has still been unable to gain access to the model as it was developed on a platform that has prohibitive barriers to entry (e.g., steps to access, training to use, etc.)

[1] The USACE HEC-RAS download page: https://www.hec.usace.army.mil/software/hec-ras/

Training (Unsteady 2D only)

Question	Why it is important to ask
What training is available on the modeling approaches used in the study?	Ask for training on 2D modeling before the modeling/mapping process begins to better know what to look for, what questions to ask, and how to use the model to its fullest potential. Information presented from FEMA or its Mapping Partner often can be at a high level such that the community does not know what to say or ask so they don't ask many questions. With training, communities can ask the appropriate questions and improve their understanding of the techniques used for the study. You don't know what you don't know so you need advice on how to use the model to its fullest potential.

Model Size (Unsteady 2D only)

Question	Why it is important to ask
How big is the model anticipated to be given the study size?	The larger the bounds of the model, the longer it takes to run. If you know you will need to run the model often, you may want to ask for more narrowly bounded models. It is important to have a mesh that is efficient and not overly detailed so model sizes and run times are not burdensome. Splitting the model into smaller segments can make it easier to review projects and permitting requests. (e.g., you usually only need to look at 1-2 miles per project review and a model may be 10+ miles long.) Note, however, breaking the model up can also lead to different challenges, such as understanding how development decisions will affect the larger study area (e.g., other segments, downstream communities, etc.).
How large are file sizes of the engineering models developed?	Corresponding to the above, two-dimensional engineering models often have very large file sizes and can be difficult for communities to utilize and/or share with developers. The smaller the model being run, generally, the smaller the file size.

What actions to take at the Project Kickoff Meeting

Confirm answers to the questions asked during Discovery. If any answers are concerning, ask for further clarification or state your alternative preferences. This is your last chance to influence changes to the model. If the changes you request have been noted at each step but not incorporated, ask why. If you are not satisfied with the answers, you can note you are proceeding under protest with potential for appeal. Any appeals require a formal review with justification and FEMA and its Mapping Partner will want to avoid that process.

What actions to take prior to and questions to ask at the Flood Risk Review Meeting

When you receive the Work Maps, you will want to review the materials to verify the Mapping Partner followed the methodology outlined and used the materials provided during the Discovery Phase, as previously described. Request a copy of the model even if you don't have ability to run it; the model should include the topographic datasets that were used. You will want to check what model and input data (topography, rainfall data, hydraulic structures, as-built information, etc.) were utilized. Make sure the current technical support data notebook (TSDN; see Glossary) is provided with the work maps. Learn more here.

Flood Risk Results

Upon review of the maps and materials, you will want to ask the following questions about the resulting flood risk results.

Question	Why it is important to ask
Are there areas where the risk classification changed? What caused the change?	Your community will be the point of contact in the future for the new maps and it is important to know how they changed and why they changed (e.g., buildings added or removed). Residents will want to know how the new mapping of the SFHA impacts them and will ask for justification. See the How to involve the public in the feedback process section below.
What are the estimated depths and extents of flooding for different events (100-year, 500-year floods)?	Your community will be using the new maps for regulatory compliance purposes and will need to know the extent of the Special Flood Hazard Areas.

What Letters of Map Revision (LOMRs) were incorporated into the updated maps?	LOMRs are instances where updated engineering modeling determines a portion of the SFHA is no longer in the SFHA. This is often due to an area being filled. If this fill is more recent than the topographic data being used for the FIRM update, this area may inappropriately be shown as in the FEMA SFHA.
How will the model results will be incorporated in the Flood Insurance Study (FIS)?	With 2D modeling, the information isn't always included into the FIS in the same way as a traditional 1D application given the information is harder to meet the FIS format. For example, flood profiles cannot always be generated. Ask FEMA or its Mapping Partners how the information you are set to receive may differ from previous iterations and how to best interpolate the results.

What actions to take prior to and questions to ask during the Preliminary Flood Maps Review Period

As a community reviewing new FEMA flood maps, you should be prepared for a 90-day appeal and comment period. During this time, residents and local officials can review the preliminary maps to understand changes to flood risk and insurance requirements and submit technical data to challenge proposed flood hazard determinations.

FEMA and its Mapping Partner will send the preliminary flood maps and other regulatory mapping products to your community for its review and comment about 30 days before the products are available to the public. This should include the materials described previously in the work map review. This is the community's opportunity to review and prepare questions about the study. Once again, make sure the current technical support data notebook (TSDN) is provided with the preliminary maps and request a copy of the model. You will again want to check what model and input data (topography, rainfall data, hydraulic structures, as-built information, etc.) were utilized.

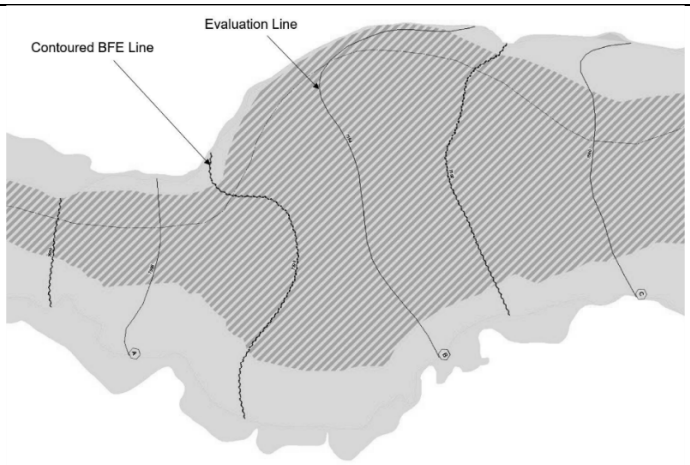
If you noted during the kickoff meeting that you were proceeding under protest with potential for appeal, this is the time to appeal if you are unhappy with the inputs used and/or results. Any appeals need to be justified with sound engineering. Instruction on the appeal process can be found FEMA's Guidance for Flood Risk Analysis and Mapping: Appeal and Comment Processing document.

Evaluation Lines (Unsteady 2D Only)

Evaluation lines are used for mapping floodways and conducting no-rise analyses. They are essentially a functional replacement for cross sections as used in steady-state or unsteady 1D models. See ASFPM's Using Maps Developed with 2D Modeling for Floodplain Management handout and/org pages 25-28 of FEMA's Guidance for Flood Risk Analysis and Mapping for more information on evaluation lines.

FEMA regulations were developed based upon a steady state modeling concept. 2D modeling results are more precise so evaluation lines average results to meet FEMA regulations. They should only be used when the averaging process will not impact any insurable buildings.

Question	Why it is important to ask
How are evaluation lines shown on FIRMs, and how can a community use them?	2D modeling generates elevations (and velocities) at grid cells. These grid cells are the best way to use the results. However, if the community does not have the ability to incorporate the results into a GIS system, the evaluation lines can be used similar to cross sections. Elevations associated with evaluation lines are listed in the FIS report like cross sections associated with 1D modeling are listed in the FIS. On FIRMs, evaluation lines are shown as curvy lines placed at whole foot BFE locations or more frequently on steeper streams. Note, in some cases, you may not be given any evaluation lines on the FIRM but instead will receive only whole foot BFE lines. The gridded results provide a more granular and direct representation of the model's output, including detailed velocity information, which can be invaluable for advanced floodplain management applications like floodproofing design or emergency planning. Evaluation lines, while useful for simplifying regulatory interpretation, inherently involve averaging and may smooth out critical localized details.

How are evaluation lines shown on FIRMs, and how can a community use them?, cont'd.	 *Figure 3. Example of Evaluation Lines and BFE Lines Used to Map Results of a 2D Based Model. Credit: FEMA Guidance for Flood Risk Analysis and Mapping, December 2020.*

Summary of Map Actions and Revalidation Letters

Question	Why it is important to ask
Which Letters of Map Amendment (LOMAs) have been validated, and which will be determined inadequate due to increases in the BFEs?	LOMAs are issued when an elevation survey shows that a building is above the Base Flood Elevation. If the BFEs are increased, homeowners that thought they were above the BFE and exempt from the mandatory flood insurance requirement may now be subject to increased flood risk and no longer exempt from flood insurance requirements. It is important to ask FEMA and its Mapping Partner about any changes to the effectiveness of existing LOMAs. The community might contact any homeowner with a LOMA that has expired due to the map update to let them know about the change and make them aware of the potential need for flood insurance so they are not surprised.

When to engage and what to look for in a consultant

If your community is set to receive new maps and the corresponding model but does not have staff with hydrology and hydraulic modelling familiarity and experience running the models used in the study in its floodplain management department, the community may want to hire a technical partner. If the community chooses to hire an independent, qualified contractor, their duties could include anything from performing more detailed reviews of any technical documentation, mapping, computer modeling, report preparation, environmental analysis, etc.

If hiring a consultant, hire them as early as possible (even before the Discovery Meeting) to start dialogue and make sure you can navigate the Risk Map process as best as possible. If your community is getting an unsteady 2D model for the first time, the consultant can help staff understand the model(s) during this transition to 2D; the community could even request training on 2D modeling as part of its Request for Proposals. It is strongly recommended that the contractor be both a licensed Professional Engineer (PE) in the state where the work is performed and a Certified Floodplain Manager (CFM).

When hiring a consultant, the community will want to look for a contractor who is familiar with the FEMA's latest Standards for Flood Risk Analysis and Mapping and can:

- Coordinate technical meetings to review and discuss technical aspects of the Risk MAP process;
- Review hydrologic and hydraulic information provided by FEMA, including review of software modeling files, technical memorandums, or other reports provided by FEMA.
- If FEMA plans to develop unsteady 2D models, ensure the contractor has demonstrated experience in creating and reviewing 2D models in the software that FEMA (or its contractor) will be utilizing;
- Provide written comments on their review of the hydrologic and hydraulic modeling information.
- Conduct independent hydrologic and hydraulic modeling to verify results developed by FEMA, using the same data sets and software models as FEMA and in accordance with FEMA standards as specified in the Risk MAP statement of work (i.e., Mapping Activity Statement or MAS);
- Compare the calculated, or computed, discharge with discharge determined from reliable gage data, if any;
- Review any technical memorandums and reports prepared by FEMA in association with the MAS, including documentation regarding data collection, topography, flood protection features, software modeling results, and any mitigation recommendations;
- Provide written comments outlining specific issues of concern, or questions regarding any technical element of the work conducted by FEMA; and

- Prepare technical memorandums and reports as may be required by FEMA to outline specific issues of concern, or questions on any technical element of the work conducted by FEMA.

The community will want to ask prospective contractors to provide a list of relevant projects similar in nature to the proposed project the firm has successfully completed before, as well as resumes for each project team member, highlighting relevant work. Again, if FEMA plans to develop unsteady 2D models, ensure the contractor has demonstrated experience in creating and reviewing 2D models in the software that FEMA (or its contractor) will be utilizing. See this example Request for Proposals from Colusa County, California.

How to involve the public in the feedback process

The initial contacts with the community will be with community staff and elected officials. However, the public will be engaged throughout the process, but especially when the process reaches the Preliminary Flood Maps Review Period. The community will want to gather as much feedback from the community as possible to head off issues when the maps are formally adopted. One community recommended providing contact information for the floodplain administrator in all outreach to hear concerns and gather feedback, as the Floodplain Administrator has a central coordinating role throughout the Risk MAP process, from initial data sharing to post-adoption enforcement. The community noted that while it may cause an increase in calls, it is better to handle concerns early in the process rather than later.

Communities should request that FEMA and its Mapping Partner hold face-to-face meetings associated with the updated flood hazard mapping. Face-to-face meetings are more likely than virtual meetings to engage community residents and make them aware of the impacts—and meeting people where they already gather (e.g., parks, recreation centers, neighborhood events) is most effective.

It is best to start outreach to residents regarding the mapping process before the community reaches the Preliminary Flood Maps Review Period to prepare them for what is to come. This could include:

- Holding a public project kickoff meeting;
- Meeting with residents to compare preliminary model results to photos of past flood events and/or historical high-water marks to ensure accuracy, and increase transparency in the process; or
- Meeting with property owners added to the FIRM to explain the impact of that change.

A major challenge is getting community residents to attend public meetings related to the updated mapping. Some options to get residents to attend are:

- Direct mailings to all building owners in the newly mapped SFHA can help to ensure that they are aware of the impacts prior to the maps being finalized; you should request FEMA or its Mapping Partner develop a "changes since last FIRM" map.
- Articles in the local newspaper with information on who to contact (e.g., the floodplain administrator) and dates of public meetings.
- Notice on the community's social media and website that keep the community apprised of the project status.
- Flyers in utility bills that highlight upcoming public information meetings.

Consider developing simplified fact sheets, interactive online maps, or visual aids that clearly illustrate flood risk changes without requiring residents to navigate complex engineering documents. If the community has surveying capability, surveying individual structures in or adjacent to the new flood hazard area so that the first-floor elevations can be correlated to the base flood elevations can be very useful. This visualization can help residents with structures in the flood hazard area understand the potential flood impacts on their structure.

Conclusion

Hopefully, with this information, your community has a better of understand of the mapping process and what questions to ask when engaging with FEMA and its Mapping Partners in the RiskMAP process, so that the final products accurately match the community's understanding of its flood risk and residents are better informed on their risk.

See also ASFPM's FEMA Risk MAP, What to Know: Managing Floodplains handout for guidance on what to do with the information received at the close of the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment and Planning (Risk MAP) process, and how to use it to manage development in the Special Flood Hazard Area (SFHA).

Appendix A: Glossary

All glossary definitions are FEMA definitions or derived from FEMA resources.

Base Flood Elevation (BFE)

The elevation of surface water resulting from a flood that has a 1% chance of equaling or exceeding that level in any given year. The BFE is shown on the Flood Insurance Rate Map (FIRM) for zones AE, AH, A1–A30, AR, AR/A, AR/AE, AR/A1– A30, AR/AH, AR/AO, V1–V30 and VE.

Cooperating Technical Partners (CTP)

Communities, state or regional agencies, universities, territories, tribes and nonprofits that have the interest and capability to:

- Have existing systems in place to support data collection and flood hazard mapping
- Have demonstrated capability to perform, implement or contract a given activity
- Ensure your community is in good standing with the NFIP
- If funding is provided by FEMA, be able to perform required financial management activities
- Have in-house staff able to monitor performance and approve projects

Datum

A datum is a coordinate system with a reference surface that serves to provide known elevations to begin surveys. If a report says that a flood will rise 100 feet, and the datum being used is sea level, it means that the flood will rise 100 feet above the sea level reference surface. Over time, technology has enabled ever more accurate ways to establish a datum that accounts for factors like gravitational pull. Vertical datum is important to ensure that like values are being used when the information in the Flood Insurance Study (FIS), such as the BFE, is being compared to other vertical data. There is a potential for error if the datums representing the height of the flood and height of the grade (ground) are mixed. FEMA primarily used the National Geodetic Vertical Datum of 1929 (NGVD 29) in the original Flood Insurance Rate Maps (FIRMs) and FISs for most communities, but began using the North American Vertical Datum of 1988 (NAVD 88) after that new datum was established. The datum used, whether NGVD 29, NGVD 88, or another, will be referenced in the FIS.

Evaluation lines

Evaluation lines in 2D floodway analysis may be thought of as virtual hydraulic cross sections similar to the physical cross sections used in 1D modeling and reported in the floodway data table. Evaluation lines should be placed on FIRMs where a detailed study included a floodway calculated based on 2D methods. Evaluation lines should also be used where a detailed study included a floodway calculated based on a hybrid 1D, 2D model where the cross sections do not cover the entire floodplain. In both cases, evaluation lines should be set at the critical locations as a reference point for floodway reporting and validating surcharge requirements. Where a 2D or hybrid 1D, 2D model was used but no floodway is calculated, evaluation lines should not be included.

FEMA Mapping Partner

Flood insurance studies are conducted on behalf of FEMA by a Mapping Partner that could be a private consultant, a federal agency, a state agency, a special district such as a flood control or watershed district, or a community (e.g., a CTP).

Flood elevation determination docket (FEDD) file

A docket established by the Federal Insurance Administrator of all matters pertaining to flood elevation determinations. At a minimum, it includes:

a) The name of the community subject to the flood elevation determination
b) A copy of the notice of the proposed flood elevation determination to the Chief Executive Officer (CEO) of the Community
c) A copy of the notice of the proposed flood elevation determination published in a prominent local newspaper of the community
d) A copy of the notice of the proposed flood elevation determination published in the Federal Register
e) Copies of all appeals by private persons received by the Federal Insurance Administrator from the CEO
f) Copies of all comments received by the Federal Insurance Administrator on the notice of the proposed flood elevation determination published in the Federal Register
g) A copy of the community's appeal or a copy of its decision not to appeal the proposed flood elevation determination
h) A copy of the flood insurance study for the community
i) A copy of the FIRM for the community
j) Copies of all materials maintained in the flood elevation study consultation docket
k) A copy of the final determination with supporting documents

See "Technical support data notebook (TSDN) & checklist."

Flood Insurance Rate Maps (FIRM)

Official map of a community on which FEMA has delineated the Special Flood Hazard Areas (SFHAs), the Base Flood Elevations (BFEs) and the risk premium zones applicable to the community.

Flood Insurance Study (FIS) profile

Flood profiles communicate flood elevations along a profile baseline for riverine Zone AE flooding sources backed by an engineering model. Unless specifically required by a Mapping Partner's contract, task order, or agreement, flood profiles are not required to be produced for model-backed Zone A streams. For these types of streams, Table 24 can be used to publish elevations at cross-section locations. Flood profiles are also not required for model-backed Zone AE streams whose 1% annual-chance flood elevations are entirely controlled by the backwater of the receiving flooding source, or for flooding sources whose studies produce static elevations and are reported in Table 10 – Summary of Non-Coastal Stillwater Elevations.

Flood Risk Report (FRR)

The Flood Risk Product that provides summary flood risk data for the entire project area, as well as for individual communities within the project area. The Flood Risk Report is not a regulatory or final source of flood risk data for the project area. Rather, it is used in conjunction with other data sources to provide a comprehensive picture of flood risk within a project area.

Flow, steady

In flow modeling, if flow depth and velocity do NOT vary with time, the flow is considered to be steady.

Flow, unsteady

In flow modeling, if flow depth and velocity DO vary with time, the flow is considered to be unsteady.

Raster datasets (i.e., grid cells)

A raster consists of a matrix of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing information. The cell values represent the phenomenon portrayed by the raster dataset, such as category or magnitude.

Letters of Map Amendment (LOMA)

A LOMA is the result of an administrative procedure in which the Federal Insurance Administrator reviews scientific or technical data submitted by the owner or lessee of property who believes the property has incorrectly been included in a designated SFHA. A LOMA amends the currently effective FEMA map and establishes that a property is not located in a SFHA. [Note: a LOMA is a kind of LOMR (see below)]

Letters of Map Revision (LOMR)

A LOMR is a letter from FEMA officially revising the current NFIP map to show changes to floodplains, regulatory floodways, or flood elevations. Reference Code of Federal Regulations Title 44 Parts 60, 65, and 72.

Lidar

Laser Imaging Detection and Ranging OR Light Detection and Ranging. It is a mapping tool used to more accurately understand the topography of the study area.

Map projection

A projection is a system of intersecting lines, as the grid of a map, on which part or all of the globe or the celestial sphere may be shown as a plane surface. Relatedly, a map projection is a mathematical model that transforms the locations of features on the Earth`s surface to locations on a two-dimensional surface. Because the Earth is three-dimensional, some method must be used to depict a map in two dimensions. Some projections preserve shape; others preserve accuracy of area, distance, or direction. Map projections project the Earth`s surface onto a flat plane. However, any such representation distorts some parameter of the Earth`s surface be it distance, area, shape, or direction.

Modeling, one-dimensional (1D) (steady flow)

The fundamental type of flow treated in open-channel hydraulics. It is a hydraulic modeling technique that simulates floodwaters primarily moving in a single direction, such as along a river or channel. It uses mathematical equations to calculate cross-sectional average water surface elevations and velocities at specific points, making it ideal for areas with confined floodplains and predictable flow paths, but it is less accurate for modeling complex, unconfined floodplains or areas with multi-directional flow.

Modeling, one-dimensional (1D) (unsteady flow)

A kind of flow modeling approach used in hydrology. In unsteady flow models, depth of flow and/or velocity of flow vary with time. FEMA-approved unsteady state models include (1) unsteady state channel routing models, which utilize inflow hydrographs produced by separate hydrologic analysis, and (2) hydrodynamic models, which include a rainfall-runoff modeling component to simulate both watershed hydrographs and channel routing.

Modeling, two-dimensional (2D)

A kind of flow modeling approach used in hydrology. The underlying assumption for one-dimensional hydraulic modeling is that the conveyances, velocities, and associated physical forces and variations are only significant in the stream direction, i.e., upstream and downstream; those in the lateral directions are negligible in modeling. As a result, the hydraulic parameters can be computed using cross sections placed perpendicular to the flow direction. Two-dimensional modeling accounts for the transverse components. Two-dimensional models solve depth-averaged equations of motion using a grid-based finite difference scheme or apply finite element solution techniques. In a two-dimensional analysis, hydraulic properties of the floodplain are computed at the grids for the finite difference scheme and at the nodes, for the finite element scheme of solution. The governing equations of a two-dimensional solution assume that topography of the ground within a grid or element, and hence the water elevation, show mild variations. The hydraulic analysis in the vicinity of control structures is computed using steady flow analysis methods for the range of discharges the structure is likely to experience.

National Flood Insurance Program (NFIP)

The NFIP is a program that makes federally-backed flood insurance available in those states and communities that agree to adopt and enforce flood-plain management ordinances to reduce future flood damage. The program of flood insurance coverage and floodplain management administered under the Act and applicable federal regulations promulgated in Title 44 of the Code of Federal Regulations, Subchapter B.

Special Flood Hazard Area (SFHA)

Flood hazard areas identified on the Flood Insurance Rate Map are identified as a Special Flood Hazard Area (SFHA). SFHA are defined as the area that will be inundated by the flood event having a 1-percent chance of being equaled or exceeded in any given year. The 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are labeled as Zone A, Zone AO, Zone AH, Zones A1-A30, Zone AE, Zone A99, Zone AR, Zone AR/AE, Zone AR/AO, Zone AR/A1-A30, Zone AR/A, Zone V, Zone VE, and Zones V1-V30.

Technical support data notebook (TSDN) & checklist

The TSDN is defined as the complete set of the most up-to-date engineering and mapping data associated with a Flood Risk Project accompanied by the applicable Flood Risk Project administration and/or process documentation (e.g. Project Narratives, project correspondence, FEDD file, TSDN checklist, certification, Engineering Data). This definition replaces the previous working definition of the TSDN as a hardcopy notebook that was submitted at the end of each mapping project, as well as partial digital TSDN submissions. For the purposes of this guidance document, specific information related to the FEDD file is referenced separately in Section 3.2.

Cover image: South Platte Park, Littleton, Colorado, May 21, 2011.
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Association of State Floodplain Managers
www.Floods.org