Guidance for Flood Risk Analysis and Mapping

Flood Risk Map

February 2018
Requirements for the Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) Program are specified separately by statute, regulation, or FEMA policy (primarily the Standards for Flood Risk Analysis and Mapping). This document provides guidance to support the requirements and recommends approaches for effective and efficient implementation. Alternate approaches that comply with all requirements are acceptable.

Table of Revisions

The following summary of changes details revisions to this document subsequent to its most recent version in February 2018.

<table>
<thead>
<tr>
<th>Affected Section or Subsection</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sections</td>
<td>February 2018</td>
<td>Aligned with the new standard making the Flood Risk Map (FRM) optional. Provided flexibility in how to create and present the FRM. Added section for considerations in selecting the best means to visualize the flood risk and moved all guidance related to the previously required FRM to an Appendix.</td>
</tr>
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1.0 Overview

The Flood Risk Map (FRM) provides a geographic overview and representation of flood risks within the project area. The FRM is not a regulatory product and is an optional product to produce for a flood risk project.

The FRM is also typically created along with the Flood Risk Report (FRR) and the Flood Risk Database (FRD), although only the FRD is required of these three products.

2.0 FRM Considerations

Because the FRM is an optional product, when it is purchased, there is flexibility with regards to its creation. As technology and cartographic tools continue to evolve, additional alternatives for the creation and delivery of the Flood Risk Map are acceptable. The FRM should cartographically present the most important information in a public friendly format. There are a variety of options for developing a FRM that meets the community’s needs. If there is uncertainty in using an approach, consult with the FEMA Regional Office.

2.1 Flood Risk Map Development Options

There are many choices in the graphics and layout of the FRM. FEMA may choose to purchase a watershed Flood Risk Map that has been typically produced since Risk MAP began – a template (Esri ArcMap MXD and MXT files) for this can be downloaded at www.fema.gov/media-library/assets/documents/32786?id=7577. Appendix A provides detailed guidance related to graphics, layout and features for the traditional paper/pdf FRM.

The template MXD file has symbolized cartographic layers for all relevant map data including colors, line weights, font styles, map legends, and suggested call-out examples for FRM users to follow. However, it is important to note that elements of the map and the call-outs (page size, font size and color, graphic size, placement on maps, etc.) can be adjusted if doing so would improve flood risk communication. There are many choices in the graphics and layout in producing the FRM.

Using the traditional FRM template, a set of Flood Risk Maps may be produced for each community throughout a watershed, coastal, or other project area. This is responsive to stakeholders that wish to see more detail about their community that is difficult to observe using the watershed-wide FRM. Development of these maps would largely follow the same guidance in Appendix A, just at a difference scale.

ESRI Story Maps or other digital alternatives can be a valuable tool to develop a Flood Risk Map that can feature a narrative, photos and mapping, all referencing data produced in the FRD. This can be a powerful way to simultaneously visualize and describe flood risk throughout the project area, and provide the opportunity to focus in at a community level within the project area.

There are other options to visualize flood risk. As technology evolves and the flood risk datasets grow throughout states and the country, web portals can be used to view datasets assembled within these larger geographies – similar to the portals some of FEMA’s external stakeholders use.
As specific successes are identified in visualizing flood risk for communities, FEMA and mapping partners are encouraged to document Best Practices and share them to help the evolution of this product.

2.2  Considerations for Choosing the Flood Risk Map Type

The most important criteria in selecting the type of FRM to be produced, including details such as page size, font details and map / graphic details, is ensuring the FRM increases the understanding of flood risk for the community and public stakeholders. The current template for a traditional FRM has flexibility to use best cartographic judgement to convey risk, plus there is the choice to produce an alternative type of FRM such as a Story Map. The following considerations should be given when choosing the appropriate type of FRM. This list is not exhaustive, and provides suggestions to consider if there is question as to how to best visualize flood risk for a given project.

- GIS capability and staff of communities: Communities with designated GIS staff and experience in the use of GIS for analysis within the community are more likely to want to focus on the FRD to produce the visualization they prefer and need. A FRM in the form of an ESRI Story Map or other digital alternative will be easy for GIS staff to update and refine, while being easy for the general public to understand. Communities without designated GIS staff may feel more comfortable with a PDF or paper-based FRM.

- Size and shape of the study area: When a watershed or other geography fits well on a D- or E-sized page, the traditional FRM can suit a community’s needs. When watersheds are very long and narrow, or oddly shaped, it can become very difficult to fit it on a traditional FRM and be readable and usable. Breaking down the project area into smaller geographies or using a different FRM type is recommended.

- Quantity of areas of mitigation interest / flooding issues: When there are a significant number of flooding issues and areas of mitigation interest in a project, it can be overwhelming to visualize all at once. When there is extensive flooding known throughout a project area, breaking down into smaller geographies (for a zoomed in view) or using a different FRM type is recommended.

- Density of areas of mitigation interest / flooding issues: When there are multiple flooding issues and areas of mitigation interest in a small area, overlapping the issues may be problematic. If an area is known to be very flood prone for a variety of reasons, or there is a wide variety of mitigation options, breaking down the project area into smaller geographies or using a different FRM type is recommended.

- Amount of data and images available to include: If the communities and stakeholders have a lot of images and data that provide value and support the flood risk products (FRPs), using an ESRI Story Map or other alternative FRM type will allow those to be displayed in an easy to understand platform. When there is minimal data, then all options are feasible.

- Variability in flood risk between communities: When there is great variability between communities in a watershed with respect to the extents of flood risk or mitigation alternatives, it may be challenging to give all communities the same watershed FRM product. In these cases, producing the FRM on a community level or using a digital alternative that communities can view their risk in more detail will be most valuable.
- Engagement of public and stakeholders: When there is extensive interest in the project from the public or other stakeholder groups, a type of FRM that can be used as a background presentation to assist in communications can be beneficial. The ESRI Story Map or digital alternative can be used with multiple groups at multiple meetings, or at a kiosk in a local community office. A static FRM provides less value in these cases.

- Anticipated ownership after project completion: If the communities in a project area are engaged in the project and it is likely they will be undertaking mitigation action and planning – or continuing to work with the FRPs beyond the project duration – a static map may not provide them the tools they need to continue to progress their own risk mitigation programs. The ESRI Story Map or other digital alternatives may provide more value and allow the communities to make updates or add to it as they complete their own mitigation projects.

2.3 Uses in Outreach, Collaboration, and Flood Risk Communication

The Flood Risk Map may be used by community and elected officials to visually support high level presentations, proposals, and discussion about flood risks within the watershed or project area. For example, the FRM identifies flood risk “hot spots” within the community and potential flood risk mitigation opportunities. This could facilitate discussions within the community about future land use and economic development planning, and steps to reduce potential flood risk for community citizens and business owners.

The FRM can also be an effective tool to use at community outreach meetings where citizens and/or local or regional media outlets are involved. This map can be an effective first visual to have posted visibly within the meeting area, as it illustrates the flood risks in the project area and conditions that may cause flooding. For watershed-based studies, it also provides a good reference for these same stakeholders who may be unaware of the watershed within which they are located, and which communities are located upstream and downstream.

Additional information is provided on the potential uses of the FRM and all FRP in the Stakeholder Engagement series of Guidance documents.

3.0 Map Features

Common elements to be used in the various types of a FRM are provided in the following sections. These elements are also applicable to the traditional FRM referenced in Appendix A of this guidance. Not all map features must be included with every FRM, and only significant map features should be shown on the FRM.

There are two general categories of map features shown on a FRM: those that are associated with a flood risk dataset (such as Areas of Mitigation Interest (AoMI), Flood Risk Assessment data, etc.), and those that are used to simply provide a cartographic enhancement or background to the FRM (such as political areas, roads, study areas, pictures, etc.).

3.1 Base Data

Base data that can be shown on the FRM includes political boundary features, planimetric data such as transportation features, hydraulic structures, and watershed boundaries. There are a
variety of base map data sources that are acceptable to use for these layers. The locations of features in the base map data files are used “as is”, and thus, Flood Insurance Rate Map (FIRM) base map accuracy requirements do not apply.

The assigned Mapping Partner should depict the following types of base data features on the FRM if they occur within the mapped area and are effective in communicating locational awareness of the flood risk within the Flood Risk Project area:

- Boundaries that identify county and state boundaries, corporate limits (where applicable), extraterritorial jurisdictional areas (ETJs), HUC-8 sub-basin boundaries, and HUC-10 watershed boundaries.
- Major transportation features: Interstates, U.S. highways, State highways, rail and significant airports (where applicable). Coastal maps may also include waterway transportation such as ferries.
- Significant hydraulic structures (e.g., levees, dams, coastal sea walls, etc.).
- A hillshade of the watershed as a background layer.

Guidance on the display order and priority for each base map layer are shown in Table 1. The Mapping Partner can use leader lines as appropriate to reduce clutter. Cartographic recommendations for these features are outlined in Table 2.

### Table 1: Overprinting Hierarchy

<table>
<thead>
<tr>
<th>Rank</th>
<th>Labels</th>
<th>Standard Map Elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rivers and Streams</td>
<td>Areas of Mitigation Interest</td>
</tr>
<tr>
<td>2</td>
<td>Jurisdiction Labels</td>
<td>Callout Lines</td>
</tr>
<tr>
<td>3</td>
<td>Transportation Features</td>
<td>Hydraulic Features</td>
</tr>
<tr>
<td>4</td>
<td>Restudy Area</td>
<td>Restudy Area</td>
</tr>
<tr>
<td>5</td>
<td>New Special Flood Hazard Area (SFHA)</td>
<td>New Special Flood Hazard Area (SFHA)</td>
</tr>
<tr>
<td>6</td>
<td>HUC-8 Sub-basin Line</td>
<td>HUC-8 Sub-basin Line</td>
</tr>
<tr>
<td>7</td>
<td>Coastal Surge Influenced Area</td>
<td>Coastal Surge Influenced Area</td>
</tr>
<tr>
<td>8</td>
<td>Corporate Limits</td>
<td>Corporate Limits</td>
</tr>
<tr>
<td>9</td>
<td>River and Stream Features</td>
<td>River and Stream Features</td>
</tr>
<tr>
<td>10</td>
<td>Lakes and Waterbody Areas</td>
<td>Lakes and Waterbody Areas</td>
</tr>
<tr>
<td>Rank</td>
<td>Item</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Transportation Features</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Flood Risk Areas</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>HUC-8 Sub-basin Area</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>HUC-10 Watershed Area</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>County Areas</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Hillshade</td>
<td></td>
</tr>
</tbody>
</table>

**Boundaries**

<table>
<thead>
<tr>
<th>Boundary</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>HUC-8 Sub-basin Boundary</td>
</tr>
<tr>
<td>2</td>
<td>Community Boundary</td>
</tr>
<tr>
<td>3</td>
<td>County Boundary</td>
</tr>
<tr>
<td>4</td>
<td>State Boundary</td>
</tr>
</tbody>
</table>

### 3.1.1 Political Boundaries

The preferred minimal source for these features is derived from the FIRM Database S_Pol_Ar feature class. Where deemed appropriate, the inclusion of political areas such as tribal lands, major military installations, state and national parks, coastal barrier resource areas, etc. is optional unless they are applicable to the Flood Risk Project.

Political areas should be labeled using their formal name. In crowded or segmented areas, feature labels can be leadered using fundamental cartographic principles that maintain map legibility. Areas located outside the project boundary should be shown on the FRM. Labeling is optional based upon cartographic judgment.

### 3.1.2 Watershed Boundaries

Data for this layer should come from the Watershed Boundary Dataset (WBD). The WBD is a companion dataset to the National Hydrography Dataset (NHD). The United States Geological Survey (USGS) and Natural Resources Conservation Service (NRCS) update and maintain the WBD as needed. The WBD boundaries delivered should be those HUCs used for the most recent FEMA prioritization.

The HUC-8 sub-basin boundary is the basis for the Flood Risk Products (FRP), unless a different geographic area has been specified. The source of this information should be the S_HUC_Ar feature class within the FRD. HUC-10 watershed boundaries may also be shown on the FRM. If this data is displayed on the map it should also be stored in the S_HUC_Ar feature class.

### 3.1.3 Transportation Features

Interstates, U.S. highways, State highways, and major airports should be shown and labeled on the FRM. Secondary roads, railroads, and ferry routes can be shown if they enhance the usability of the map. Road shield labels should be placed on the line it represents, and horizontal to the
map frame. Other transportation features should be added at the Mapping Partner’s discretion, as long as their addition does not impair the legibility of the map. Transportation labels may be leadered to the features as necessary.

### 3.1.4 Hydraulic Structures

All levees (or other flood control features), dams or other significant hydraulic structures should be shown on the FRM. A label may be placed if the structure(s) necessitate a label.

### 3.1.5 Topographic Hillshade

The watershed hillshade should be shown on the paper or graphic Flood Risk Map to convey a sense of the watershed’s overall topographic relief. As this layer is only intended to help support the overall picture of what the project area looks like, it is not necessary that the hillshade be generated from the same terrain data source that was used in the engineering study. A more readily available terrain data source that covers the entire project, such as the USGS 10 meter or 30-meter digital elevation model (DEM), may be used to produce the hillshade layer.

### 3.1.6 FRM Base Data Symbology

#### Table 2: Recommended Base Data Fonts and Symbology

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation *, ** [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
</table>
| ![Boundary Example](example1) | Counties (within Watershed or Project Area) | Top Line, Line weight 0.4 Pt., Black, Dashing [6pt- 1pt- 3pt- 1pt]  
Bottom Line, Line weight 3 Pt., Grey (170, 170, 170) |
| ![Boundary Example](example2) | Counties (outside Watershed or Project Area) | Grey (225, 225, 225)  
Top Line, Line weight 0.4 Pt., Black, Dashing [6pt- 1pt- 3pt- 1pt]  
Outline, Line weight 3 Pt., Blue (170, 170, 170)  
50 Percent Transparency |
| ![Boundary Example](example3) | Corporate Limits (within Watershed or Project Area) | Outline, Line weight 1.5 Pt., Black |
| ![Boundary Example](example4) | Corporate Limits (outside Watershed or Project Area) | Grey (204, 204, 204)  
Outline, Line weight 1.5 Pt., Grey (104, 104, 104)  
50 Percent Transparency |
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation * , ** [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="HUC-8 Sub-basin" /></td>
<td>HUC-8 Sub-basin</td>
<td>Outline, Line weight 3 Pt., Blue (0, 77, 168)</td>
</tr>
<tr>
<td><img src="image" alt="HUC-10 Watershed" /></td>
<td>HUC-10 Watershed</td>
<td>Outline, Line weight 1 Pt., Grey (104, 104, 104) 20 Percent Transparency</td>
</tr>
<tr>
<td><img src="image" alt="Flood County" /></td>
<td>County Label</td>
<td>8-14 Pt. Times New Roman Bold, Italic, Aligned center., Black, Centered; 1.0 Pt. Halo, White, CLC</td>
</tr>
<tr>
<td><img src="image" alt="City, Village, or Other" /></td>
<td>Community Area Label</td>
<td>8-14 Pt. Times New Roman Bold, Black, Centered; 1.0 Pt. Halo, White, CLC</td>
</tr>
<tr>
<td><img src="image" alt="Fort Bragg Military Base" /></td>
<td>Area Label</td>
<td>14 Pt. Times New Roman, Bold, Black, Centered 1.0 Pt. White Halo, CLC</td>
</tr>
<tr>
<td><strong>Transportation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><img src="image" alt="Interstates" /></td>
<td>Interstates</td>
<td>Top Line, line weight 1 Pt., White Bottom Line, line weight 2 Pt., Black</td>
</tr>
<tr>
<td><img src="image" alt="Interstate Highway" /></td>
<td>Interstate Highway, can be ESRI standard or equivalent</td>
<td>Interstate Marker – 24 Pt., Black Interstate Marker – 24 Pt., Blue (0, 0, 255) Interstate Marker – 24 Pt., Red (255, 0, 0) 7 Pt. Arial Bold Narrow, White, CAPS</td>
</tr>
<tr>
<td><img src="image" alt="U.S. Highway Symbol" /></td>
<td>U.S. Highway Symbol, can be ESRI standard or equivalent</td>
<td>Standard U.S. Route Shield Size 0.200” x 0.200” to 0.400” x 0.480” 8 Pt. Arial Bold Narrow, Black, 0.75 Pt. White Halo, CAPS Line weight 0.72 Pt., Black</td>
</tr>
<tr>
<td><img src="image" alt="State Highway Symbol" /></td>
<td>State Highway Symbol, can be ESRI standard or equivalent</td>
<td>Circle Diameter 0.200” to 0.280” 8 Pt. Arial Bold Narrow, Black, 0.75 White Halo, CAPS Line weight 0.72 Pt., Black</td>
</tr>
<tr>
<td>Example</td>
<td>Feature</td>
<td>Recommendation *, ** [Hatch Pattern] (RGB Values)</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>234</td>
<td>County Highway Symbol (optional), can be ESRI standard or equivalent</td>
<td>Rectangle Size .150” x .250” to 0.300” x 0.400”&lt;br&gt;8 Pt. Arial Bold Narrow, Black, 0.75 Pt. White Halo, CAPS&lt;br&gt;Line weight 0.72 Pt., Black</td>
</tr>
<tr>
<td></td>
<td>Major Roads</td>
<td>Top Line, Line weight 1 Pt., Yellow (255, 255, 190)&lt;br&gt;Bottom Line, Line weight 2 Pt., Red (255, 0, 0)</td>
</tr>
<tr>
<td>SPRING CREEK LANE</td>
<td>Major Roads Label (optional)</td>
<td>8 Pt., Arial Bold, Black, Aligned left, 0.75 Pt. White Halo, CAPS</td>
</tr>
<tr>
<td>Dulles International Airport</td>
<td>Major Airport</td>
<td>12 Pt., Calibri Bold, Aligned center, Grey (78, 78, 78), 1 Pt. White Halo, CLC</td>
</tr>
<tr>
<td>Floodville Community Airport</td>
<td>Airport (optional)</td>
<td>8 Pt., Calibri Bold, Aligned center, Grey (78, 78, 78), 1 Pt. White Halo, CLC</td>
</tr>
</tbody>
</table>

**Hydraulic Structures**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Recommendation *, ** [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Levees, (or other flood control structures) represented as line features</td>
<td>Top Line, Black, Line weight 1.5 Pt., Dashing [2pt - 1pt]&lt;br&gt;Bottom Line, Line weight 2 Pt., White, Dashing [2pt - 1pt]</td>
</tr>
<tr>
<td>Dams (if not included as an Area of Mitigation Interest)</td>
<td>Circle Marker, 0.06” Diameter, Black&lt;br&gt;Outline, Line weight 0.1 Pt., White (255, 255, 255)</td>
</tr>
<tr>
<td>Significant Hydraulic Structures</td>
<td>Top Circle Marker, 0.05” Diameter, (255, 0, 197)&lt;br&gt;Bottom Circle Marker, 0.06” Diameter, Black&lt;br&gt;Outline, Line weight 0.1 Pt., White (255, 255, 255)</td>
</tr>
<tr>
<td>STRUCTURE NAME</td>
<td>Structures Label (optional)</td>
</tr>
</tbody>
</table>

**Hillshade**
3.2 Flood Hazard Data

The assigned Mapping Partner should depict the following types of flood features on the FRM if they occur within the mapped area. Recommendations for flood hazard data are presented in Table 3.

3.2.1 Hydrographic Features

Hydrographic features (streams, lakes, ponds, bays, and oceans) that have an identified flood hazard and formal name should be labeled. In areas where a large number of small stream features could render the map unreadable due to excessive clutter, it is acceptable for only the main streams to be labeled. Stream name labels should be placed parallel to the feature. The application of curved labels, also known as splining, is allowed. Large hydrographic features, such as oceans and lakes, may be labeled using larger font sizes where applicable.

3.2.2 New SFHAs

New SFHAs are from newly studied, non-coastal flooding sources resulting from the Flood Risk Project. All SFHAs within the FIRM database not related to coastal flooding should be used to compose this layer.

3.2.3 Coastal Surge Influenced Area

Coastal Surge Influenced Areas are any newly studied coastal flooding polygons resulting from the Flood Risk Project. Only coastal flooding SFHAs within the FIRM database should be used to compose this layer.
### 3.2.4 FRM Flood Hazard Data Symbology

#### Table 3: Recommended Flood Hazard Data Fonts and Symbology

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation*; ** [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>River, Stream, or Other Hydrographic Feature</strong></td>
<td>Line weight 1 Pt., Blue (151, 219, 242)</td>
<td></td>
</tr>
<tr>
<td><strong>Lake</strong></td>
<td>Blue (151, 219, 242) Outline, Line weight 0.4 Pt., Blue (64, 101, 235) 50 Percent Transparency</td>
<td></td>
</tr>
<tr>
<td><strong>Missouri Creek</strong></td>
<td>Name of River, Stream, or Other Hydrographic Feature 5-10 Pt., Times New Roman Bold, Italic, Aligned left., Blue (0, 77, 168), 0.75 Pt. White Halo, CLC</td>
<td></td>
</tr>
<tr>
<td><strong>Restudy Area</strong></td>
<td>Top Line, Line weight 1.5 Pt., Orange (255, 85, 0) Bottom Line, Line weight 3 Pt., Yellow (255, 255, 0)</td>
<td></td>
</tr>
<tr>
<td><strong>New SFHA</strong></td>
<td>Area Pattern #1, Line weight 0.7 Pt., Grey (107, 126, 174), Angle 45 degrees, Offset 0, Separation 0.1” Area Pattern #2, Top Line, Line weight 0.7 Pt., Grey (107, 126, 174), Angle 135 degrees, Offset 0, Separation 0.1”</td>
<td></td>
</tr>
<tr>
<td><strong>Coastal Surge Influenced Area</strong></td>
<td>Area pattern #1, Line weight 1.5 Pt., Dark Green (60, 130, 60), Angle 135 degrees, Offset 0, Separation 0.2” Area pattern #2, Line weight 1.5 Pt., Dark Green (60, 130, 60), Angle 135 degrees, Offset 0, Separation 0.2”</td>
<td></td>
</tr>
</tbody>
</table>

Note:
* Alternate fonts that emulate these recommendations may also be used
**When producing FRM types such as an ESRI Story Map, font size may not be relevant; instead ensure readability of any text for the delivery method (desktop, mobile, projection).
3.3 Flood Risk Data

The objective of the flood risk data layer shown on the FRM is to show the dollar value of risk, and to draw attention to the areas of highest risk within the project area at a high level. The flood risk data shown on the FRM are based on the flood loss values from the Flood Risk Assessment dataset and symbolized at the census block level. The 1-percent-annual-chance flood risk assessment results are typically used for the purposes of symbolizing this data on the FRM, although other scenarios, such as the annualized losses, can be used if they help better communicate relative flood risk within the project area.

Two different types of Census block data can be stored in the FRD. Beginning with Hazus 2.2 SP1, the Hazus model provided the user the ability to conduct analysis for either homogenous or dasymetric census blocks. Homogenous census blocks represents the “full” census blocks traditionally used for risk assessment where only open water areas have been clipped out of the original census block boundaries from the US Census Bureau. Dasymetric census blocks have had additional “undeveloped” land areas (primarily wetlands and forest) clipped out of the original census block boundaries based on Land Use-Land Cover data from the USGS. The decision to use homogenous or dasymetric census block data is left to the discretion of the FEMA Regional Project Officer and Mapping Partner producing this dataset. Therefore, FRM developers will need to consider these different census block data types when making flood risk data symbology choices.

Five relative flood risk categories are most commonly used for depiction and symbolization of this data on the FRM – Very Low, Low, Medium, High, and Very High. However, multiple approaches exist for classifying the flood risk data results into one of these five categories. The quantity ranges should be determined relative to the total risk within the project area. Although no one method is preferred over another, and other symbolization methods may be applied, one simple option for categorization of the flood risk data is to start by using the Natural Breaks (Jenks) method. Within ArcGIS (or similar) software, five classes of breaks can be set using the Natural Breaks method, which helps assign the flood risk values into different classes based on the overall range and distribution of the flood risk values. This approach is fairly quick and automated, and often limits the number of census blocks that would get displayed in the “Very High” category, but may also add many census blocks into the “Very Low” category for larger project areas.

For projects whose flood risk assessment data is produced at the site-specific level, the census block-based risk assessment data can be used when symbolizing the census blocks on the FRM if that data is available. However, in addition to, or in place of, this, the flood risk assessments calculated at the building level can also be depicted as points on the FRM, or as the aggregation of points to identify hot spots and concentrated areas of higher risk.
Symbology recommendations are to use a light color for the very low category, and then gradually increase to a bold color for very high (with a 20 percent transparency for each).

### 3.4 Areas of Mitigation Interest (AoMI)

Specific guidance exists that outlines the collection and creation process for the Areas of Mitigation Interest (AoMI) dataset. Depending on their proximity to one another, not all AoMIs in the Flood Risk Database may be able to be clearly shown on the FRM. Some may naturally overlap others, causing overprints of the AoMI point features on the FRM. If this is the case, there is no prescription for which types of AoMI have a higher display priority on the FRM than others. Those decisions should be made on a project-by-project basis.

It is also important to know that AoMI points used to depict past claims or repetitive loss data cannot be location-specific. In other words, in areas where there may be higher quantities of this type of privacy-sensitive data, the AoMI points should be aggregated and displayed at the centroid of a census block, so as not to allow one to be able to identify specific structures.

Table 4 provides suggestions for the symbolization of this data on the map.

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation *, ** [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>🔴</td>
<td>Non-accredited Levees</td>
<td>Diamond Marker – 28 Pt., Black 2 Pt. White Halo</td>
</tr>
<tr>
<td>Example</td>
<td>Feature</td>
<td>Recommendation * , ** [Hatch Pattern] (RGB Values)</td>
</tr>
<tr>
<td>---------</td>
<td>---------</td>
<td>--------------------------------------------------</td>
</tr>
</tbody>
</table>
| ![X]    | Coastal Structures | Cross Hair Marker – 16.8 Pt., Red (230, 0, 0)  
Circle Marker – 16.8 Pt., White  
Circle Marker – 19.6 Pt., Red (255, 0, 0)  
Circle Marker Outline – 28 Pt., Black  
Circle Marker – 28 Pt., Yellow (255, 255, 0) |
| ![Green] | Stream Flow Constriction | Square Marker Outline – 21 Pt., Black  
Square Marker – 21 Pt., Green (0, 255, 0) |
| ![Green] | Past Claims Hot Spot | Hexagon Symbol Outline – 76 Pt., Green (85, 255, 0)  
Hexagon Symbol Outline – 80 Pt., Green (211, 255, 190) |
| ![Red] | Key Emergency Routes Overtopped During Frequent Flooding Events | Circle Marker Outline -20.57 Pt., Black  
Circle Marker – 20.57 Pt., Red (230, 76, 0)  
Circle Marker – 24 Pt., Blue (0, 92, 230) |
| ![Red] | At-Risk Essential Facilities | Circle Marker Outline -20.57 Pt., Black  
Circle Marker – 20.57 Pt., Green (85, 255, 0) |
| ![Icon] | Significant Land Use Changes (within the past 5 years and looking forward 5 years) | Symbol Hatch Marker – 80 Pt., Black |
| ![Icon] | Non-Levee Embankments | Symbol Marker Outline – 24 Pt., Black  
Symbol Marker – 24 Pt., Blue (115, 178, 255) |
| ![Star] | Other | Symbol Marker Outline – 30 Pt., Black  
Symbol Marker – 30 Pt., Orange (255, 170, 0) |

Note:
* Alternate fonts that emulate these recommendations may also be used  
**When producing FRM types such as a Story Map, font size may not be relevant, instead ensure readability of any text for the delivery method (desktop, mobile, projection).

### 4.0 FRM Variations for Coastal Areas

For coastal projects, several variations can and should be applied when producing the FRM. Since different flood risk data may be produced as part of a coastal study, the AoMIs for a coastal FRM may reasonably be different from a typical watershed FRM.
The legend for the coastal FRM should show any new VE Zones if they were produced for the study. Table 5 shows the recommended symbology for the depiction of these features on the FRM.

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Specification [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Hatch Pattern" /></td>
<td>New Zone VE</td>
<td>Line weight 2 Pt., Red (255, 0, 0), Angle 90 degrees, Offset 0, Separation 9</td>
</tr>
</tbody>
</table>

### Table 5: Recommended Symbology for Coastal-Specific Legend Features

**5.0 FRM Variations for Dams**

Similar to coastal FRMs, for projects that have assessed the risks associated with a dam, several minor variations can and should be applied when producing the FRM. Since different flood risk data may be produced for dams, the AoMIs for a dam FRM may reasonably be different from a typical watershed FRM. In general, a FRM is anticipated to be produced for each dam scoped to be studied in the project area. However, if multiple dams are studied in close proximity to each other, a single FRM may be produced for multiple dams assuming that the flooding risk can be readily communicated on the combined product.

For a dam FRM, the inundation scenario should be presented using Figure 2 as a basis for how it is visualized. In the case of the traditional print/PDF watershed FRM, Figure 2 also shows how the legend should be modified to include any inundation scenarios presented on the map.

---

**Figure 2: Inundation Scenario Legend Example**

**Upstream Inundation Scenario (Event, Reservoir Condition)**

- Sunny Day, Normal Pool
- 1/2 of PMP, Top of Dam

**Downstream Inundation Scenario (Event, Release Type, Reservoir Condition)**

- Sunny Day, Piping, Normal Pool
- 1/2 of PMP, Overtop, Top of Dam

---

### 6.0 FRM Variations for Levees

In general, a FRM is anticipated to be produced for each levee scoped to be studied in the project area. However, if multiple levees are studied near each other, or a type of FRM is selected that can display various areas clearly on the product (such as the ESRI Story Map), a single FRM may
be produced for multiple levees assuming that the flooding risk can be readily communicated on the combined map.

If levee freeboard is shown on the primary map, Figure 3 shows an example for visualizing the freeboard, as well as how the legend should appear on a traditional print/PDF watershed FRM.

**Figure 3: Levee Freeboard Legend Example**

If the flood risk datasets showing historic levee breach locations (S_Lev_Breach_Pt) and/or drainage or protection structures along the levee (S_Lev_Elements_Pt) are produced as part of the Flood Risk Project, these point features should be used, included within the Areas of Mitigation Interest section of the legend for a traditional print/PDF watershed FRM. Figure 4 provides an example of how this could be shown.

**Figure 4: Levee Areas of Mitigation Interest Legend Example**
Appendix A: Traditional Watershed Flood Risk Map Guidance

This Appendix provides guidance specific to the graphics, layout and features of a traditional watershed FRM. The guidance contained in the main body of this document is applicable for all products, including this traditional watershed FRM. This Appendix contains additional details that apply only to this printed/pdf FRM product.

1.0 Map Graphics and Layout

1.1 Page Size

FRM panels can be printed in portrait or landscape orientation, on ARCH E-size paper using the dimensions shown below:

- Trimmed paper size
  - Portrait: (ARCH E) Height 48” x Width 36”
  - Landscape: (ARCH E) Height 36” x Width 48”

- Map Panel border
  - Portrait: Height 37.25” x Width 35”
  - Landscape: Height 25.25” x Width 47”
Figure A1: Example of a Flood Risk Map Developed at the Watershed Level
1.2 Map Layout and Dimensions

The FRM panel should have dimensions that make the map readable. A Portrait or Landscape layout will be chosen by the Mapping Partner to best fit the project area based on the polygon in S_FRD_Proj_Ar. It is recommended that the map panel frame outline be 1 Pt. with a color of black (Red, Green, Blue – RGB: 0,0,0). Suggested layout dimensions are depicted in Figure A2 and Figure A3, and are also listed below.

- North Arrow, Scale border
  - Height 4” x Width 1.5”

- Legend
  - Portrait: Height 7” x Width 19.5”
  - Landscape: Height 7” x Width 31.5”

- Project Locator
  - Portrait: Height 7” x Width 6”
  - Landscape: Height 7” x Width 6”

- Title Block, FEMA Logo border
  - Portrait: Height 7” x Width 7.5”
  - Landscape: Height 7” x Width 7.5”

- FEMA Logo
- Portrait: Height 2.25” x Width 6.3”
- Landscape: Height 2.25” x Width 6.3”
1.3 Map Title

The title on the map should be the name of the project area and should match the FRR and the data in the PROJ_NM field in the S_FRD_Proj_Ar feature class of the FRD. As depicted on the FRM, it is recommended that the first part of the map title be Arial, Bold, 82 pt., aligned center with a color of black (RGB: 0,0,0). For the second part of the map title (the watershed or project name) it is recommended that it be Arial, Bold, Italic, 82 pt., aligned center with a color of black (RGB: 0,0,0). Alternate fonts that emulate these recommendations may also be used.

1.4 Legend (Map Symbology)

The map legend should contain those items that are needed to assist the map user in interpreting map symbols, base data, flood hazard data, flood risk, and Areas of Mitigation Interest (AoMIs) (see Figure A4). It is recommended that the legend title be Franklin Gothic Medium, 28 pt., aligned left with a color of black (RGB: 0,0,0). It is recommended that the legend category title be Franklin Gothic Medium, 24 pt., aligned center or left with a color of black (RGB: 0,0,0). It is recommended that the legend item label be Franklin Gothic Medium, 18 pt., aligned left with a color of black (RGB: 0,0,0). Alternate fonts that emulate these recommendations may also be used.
1.5 Project Locator Diagram

The project locator serves as a reference to orient the map user as to where the project area exists in relation to other known locations, (e.g., adjacent watersheds or counties). The following guidance applies to the preparation of the project locator diagram (Figure A5):

- The diagram size may vary with the size of the watershed or project area and the space constraints of the diagram.
- The diagram should center on the project area and should show adjacent county or watershed boundaries significant to the project area.
- Visible states and significant bodies of water should also be labeled.
- The diagram should have the mapped Project Area highlighted.
- North orientation should be consistent with the Project Locator and the Map Panel.
If applicable, the watersheds immediately adjacent (share a border) to the studied watershed should be numbered using their eight-digit Hydrologic Unit Code (HUC-8). If the study is not a sub-basin study (i.e., county-based, Coastal-only Project, Physical Map Revision (PMR), or projects consisting of a single or potentially multiple Levees or Dams), adjacent counties are suggested to be shown and labeled.

Recommended fonts and symbology are described in Table A1.

### Table A1: Recommended Project Locator Fonts and Symbology

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PROJECT LOCATOR</strong></td>
<td>Title</td>
<td>28 Pt., Franklin Gothic Medium, Aligned center, Black (0, 0, 0), CAPS</td>
</tr>
<tr>
<td>12345678</td>
<td>Project Area or Watershed Label</td>
<td>12-22 Pt., Arial Bold, Aligned center, Blue (0, 77, 168), 2 Pt. White Halo</td>
</tr>
<tr>
<td>12345678</td>
<td>Adjacent Watershed or County Label</td>
<td>10-14 Pt., Arial Bold, Italic, Aligned center, Black (0, 0, 0), 2 Pt. White Halo</td>
</tr>
<tr>
<td><strong>State</strong></td>
<td>State Label</td>
<td>12-22 Pt., Arial Bold, Italic, Aligned center, Brown (115, 0, 0), 2 Pt. White Halo, CLC</td>
</tr>
<tr>
<td><strong>Lake Erie</strong></td>
<td>Major Body of Water</td>
<td>10-14 Pt., Arial, Italic, Aligned center., Blue (0, 92, 230), CLC</td>
</tr>
<tr>
<td><img src="image" alt="Project Area" /></td>
<td>Project Area</td>
<td>Grey (225, 225, 225) Outline, Line weight 3 Pt., Grey (104, 104, 104)</td>
</tr>
<tr>
<td><img src="image" alt="Surrounding Watersheds or Counties" /></td>
<td>Surrounding Watersheds or Counties</td>
<td>Outline, Line weight 3 Pt., Grey (204, 204, 204)</td>
</tr>
</tbody>
</table>
**1.6 Title Block**

Every FRM should contain a title block that contains the name of the project area (and HUC-8 code if applicable), and the release date. The project area name should match the FRR and the data in the field PROJ_NM in the S_FRD_Proj_Ar feature class. The HUC-8 code can go after the project name if the study is watershed based. The HUC-8 code can be found in the HUC8_CODE field in the S_FRD_Proj_Ar feature class. Table A2 provides recommendations for the title block features.
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Title Block Neatline</td>
<td>3 Pt. Black (0,0,0)</td>
</tr>
<tr>
<td></td>
<td>Risk MAP Header</td>
<td>40 Pt. Franklin Gothic Medium Cond, Blue (0, 82, 171), Aligned Left</td>
</tr>
<tr>
<td></td>
<td>Dividing Line</td>
<td>3 Pt. Black (0,0,0) Horizontal Line, 6.9” Wide</td>
</tr>
<tr>
<td></td>
<td>FRM Header</td>
<td>56 Pt. Franklin Gothic Medium, (168, 194, 194), Aligned Left, CAPS</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30 Pt. Franklin Gothic Medium, Grey (168, 194, 194), Aligned Left, CAPS</td>
</tr>
</tbody>
</table>

**Table A2: Recommended Title Block Fonts, Notes, and Symbology**
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Department of Homeland Security Seal</td>
<td>Width: 6.3”</td>
</tr>
<tr>
<td></td>
<td>Place this seal on the right side of the title block</td>
<td>Height: 2.25”</td>
</tr>
<tr>
<td>PROJECT NAME, HUC-8 Code</td>
<td>Project Name text (HUC-8 Code if applicable). Place this text below FRM Header.</td>
<td>28 Pt. Arial, Aligned Left, Black CAPS</td>
</tr>
<tr>
<td>RELEASE DATE 12/31/9999</td>
<td>Release date text. Place this text in the bottom right corner of the title block.</td>
<td>24 Pt. Franklin Gothic Medium Cond, Blue (0.82,171), Aligned Right, CAPS</td>
</tr>
<tr>
<td></td>
<td>This note identifies that the Flood Risk Map corresponds to data in the Flood Risk Database and the Flood risk report. Replace “Watershed” text with the name of the watershed or project area studied. Place this note in the bottom left corner of the title block.</td>
<td>16 Pt. Arial, Aligned Left, Black</td>
</tr>
</tbody>
</table>

For more information on the data used for this map, please consult the Project Name Flood Risk Database and Flood Risk Report.

Note:
* Alternate fonts that emulate these recommendations may also be used
1.7 Scale and North Arrow

The extent of the FRM is to be determined by the Mapping Partner. The initial extent is generally based on the project area (S_FRD_Proj_Ar) but may be adjusted to allow room for supporting data or extra room within the layout for callout boxes, and can be scaled to fit appropriately. The map should also have a north arrow, a scale bar, and scale text. Table A3 gives a list of recommendations for the north arrow and scale features.

Table A3: Recommended North Arrow and Scale Symbology

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="North arrow" /></td>
<td>North arrow; can be ESRI standard or equivalent Place to the left of scale bar.</td>
<td>Line weight 0.72 Pt. Width 0.2219&quot; Height 0.9819&quot; Black</td>
</tr>
<tr>
<td><img src="image" alt="Top and Bottom line" /></td>
<td>Top and Bottom line</td>
<td>3 Pt. Black (0,0,0) Horizontal Line 4&quot; Wide</td>
</tr>
<tr>
<td><img src="image" alt="Scale bar" /></td>
<td>The FRM scale bar includes references to miles. Note that this scale bar is not shown to actual size; can be ESRI standard or equivalent. Place within Map Panel frame in the bottom left, center or right. Mapping Partner should make the scale bar length equal to a whole number, and the dividers set at half or thirds of the entire scale bar length.</td>
<td>Line weight 1.0 Pt. (Scale Bar [Miles]) Length: 5&quot;, Black (Scale Bar Labels) 22 Pt. Arial, Black CAPS</td>
</tr>
</tbody>
</table>

Note:

* Alternate fonts that emulate these recommendations may also be used
1.8 Page Content

The following sections describe the extent of the mapping, overprint hierarchies, and graphic recommendations for the body of the map.

1.8.1 Geographic Extent

The FRM is intended to be prepared on a HUC-8 sub-basin basis. This follows FEMA's watershed-based approach to represent the impacts of floods in a natural flow regime rather than in relation to political boundaries. Notwithstanding, other project area extents may exist depending on the scope of the project. Regardless, the extent of the map should be selected based on consideration of the project footprint and overall usability of the map as a resource that can facilitate collaborative flood risk activities.

1.8.2 Map Body

The body of the FRM should be comprised of base data, flood hazard data, flood risk data, and Areas of Mitigation Interest. Labels should be placed automatically for as many features as possible, with the source of each label coming directly from within the database. In areas with a large number of features to be labeled, the Mapping Partner should take advantage of font size flexibility for placing feature labels. Reducing font size on applicable features should be generally considered before overprinting that feature. Overprint hierarchies and graphic recommendations are provided in the tables below, with separate paragraphs emphasizing information of particular importance. The graphic recommendations in Table 4 through Table 6 provide cartographic hierarchies for map body features, as well as examples and feature descriptions, including line weights, fonts, hatching, and RGB color identities.

1.8.3 Overprinting

Overprinting is the placement of text such that it overlaps other map features or text. Where a text overprint cannot be avoided within the map body, it is suggested that the hierarchies listed in Table A4 be followed.

Table A4: Overprinting Hierarchy

<table>
<thead>
<tr>
<th>Rank</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labels</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Rivers and Streams</td>
</tr>
<tr>
<td>2</td>
<td>Jurisdiction Labels</td>
</tr>
<tr>
<td>3</td>
<td>Transportation Features</td>
</tr>
<tr>
<td>Standard Map Elements</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Areas of Mitigation Interest</td>
</tr>
<tr>
<td>2</td>
<td>Callout Lines</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulic Features</td>
</tr>
<tr>
<td>4</td>
<td>Restudy Area</td>
</tr>
</tbody>
</table>
### 1.8.4 Hierarchy for Labels and Map Features

Table A4 illustrates the order of priority (rank) of the various items depicted in the map body. These lists should be used as a guideline to resolve overprinting issues for labels and map features. The items are listed in rank from most important to least important. Those items with a lower numbered rank (e.g., 1) may be printed on top of higher numbered rank (e.g., 3) items.

### 1.8.5 Leader Lines

Labels may be leadered to a feature using a plain leader if space does not permit the label to be within or adjacent to the feature. It is recommended to use a line weight of 1.0 pt, with a color of black (RGB: 0,0,0) for the leader lines.

### 2.0 Map Features

Guidance for specific elements of the FRM (excluding the call-outs, which can be adjusted as needed) is provided in the following sections. Not all map features must be included with every FRM, and only significant map features should be shown on the FRM. Cartographic abstraction is acceptable to fit multiple features into a small geographic area, and the FRM should be designed to show the user the type and extent of data contained within the FRD. A project area mask may also be applied to gray out any data not directly within the project area itself.
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
</table>
| ![Non-accredited Levees](image) | Hollow Fill Outline – 'Freeway, Under Construction ESRI' Line Symbol with Modified Colors and Line Widths.  
  - 1st Layer – 4 Pt., White  
  - 2nd Layer – 3.5 Pt., Black  
  - 3rd Layer – 2.5 Pt., Black  
  - 4th Layer – 3.5 Pt., Black | |
| ![Coastal Structures](image) | Hollow Fill Outline – 'Freeway, Under Construction ESRI' Line Symbol with Modified Colors and Line Widths.  
  - 1st Layer – 2.25 Pt., White  
  - 2nd Layer – 3 Pt., Light Blue (190, 232, 255)  
  - 3rd Layer – 2.25 Pt., Blue (0, 92, 230)  
  - 4th Layer – 3 Pt., Light Blue (190, 232, 255) | |
<p>| <img src="image" alt="Stream Flow Constriction" /> | Hollow Fill Outline – 3 Pt., Green (0, 255, 0) | |</p>
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
</table>
| ![Past Claims Hot Spot](image1) | Past Claims Hot Spot | Hexagon Symbol Fill – 16 Pt., Green (85, 255, 0), 11 Pt. Separation X and Y Outline – ‘Single, Nautical Dashed ESRI’ Line Symbol with Modified Colors and Line Widths.  
- 1st Layer – 2.5 Pt., Green (38, 115, 0)  
- 2nd Layer – 3 Pt., White |
| ![Key Emergency Routes](image2) | Key Emergency Routes Overtopped During Frequent Flooding Events | Hatch Line Fill – 2 Pt., Red (230, 76, 0), 315 Degree Angle, 5 Pt. Separation Outline: 2 Pt. Black |
| ![At-Risk Essential Facilities](image3) | At-Risk Essential Facilities | Vertical Line Fill –  
- 1st Layer – 2 Pt., Red (255, 0, 0), 1.25 Pt. Offset, 5 Pt. Separation  
- 2nd Layer – 1 Pt., White, 0 Pt. Offset, 5 Pt. Separation Outline – 2 Pt., Yellow (255, 255, 0) |
| ![Significant Land Use Changes](image4) | Significant Land Use Changes (within the past 5 years and looking forward 5 years) | Crosshatch Fill  
- 1st Layer – 0.5 Pt., White, 135 Degree Angle, 5 Pt. Separation  
- 2nd Layer – 0.5 Pt., White, 45 Degree Angle, 5 Pt. Separation 5. Outline – 2 Pt., White |
<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation*</th>
</tr>
</thead>
</table>
| ![Non-Levee Embankments](image) | Hatch Pattern | Hatch Line Fill – 2 Pt., Blue (115, 178, 255), 45 Degree Angle, 5 Pt. Separation  
Outline: 2 Pt. Black  |
| ![Other](image) | ![Star Symbol Fill](image) | Star Symbol Fill –  
1st Layer – 8 Pt., Black, 5 Pt. Separation X and Y  
2nd Layer – 10 Pt., Orange (255, 170, 0), 5 Pt. Separation X and Y  
1st Layer – 2 Pt., Black  
2nd Layer – 3 Pt., Orange (255, 170, 0) |

### 2.1 Callouts

Callouts are a way to highlight and point the reader towards specific areas within the overall project area that may warrant additional discussions or focus in outreach meetings and communications (see Figure A6). The Project Team should work with the community to determine what items are to be shown on the FRM as callouts. Each callout should contain an image, title, and descriptive text to be shown on the FRM. These callouts can be used to highlight things such as AoMIs (i.e., S_AOMI_Pt), areas of high risk, or other significant locations.
General guidance and recommendations on the placement of callouts follows, but as with all guidance, variations to this may be implemented if doing so would enhance the overall product (see Figure A7).

2.1.1 Callout Lines

Callouts can be shown on the FRM if desired. Callouts should be placed in the areas surrounding the project area in the white space of the map and should not overlap the project area. The callout box should be centered on the initial (from) node of the line, while the final (to) node of the line should point to the actual map feature being showcased by the callout. There should generally be one line per callout box. Each line is used as the leader line for the callout boxes. The size of the callout image is suggested to be 4” x 6” or 6” x 4”, with the descriptive text box directly below the image and matching the width of the image. The descriptive text may be placed elsewhere in relation to the image if necessary. The Mapping Partner should adjust the layout orientation of the callout box according to the image orientation of the image being included (portrait or landscape).
2.1.2 Callout FRD-Related Guidance

- Callout Image:
  - Callout Height stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_HEIGHT
  - Callout Width stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_WIDTH
  - Format: 300 dpi, 24-bit depth
  - Storage: Stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_BINARY – additional guidance on how to load the image within the appropriate FRD field can be found within the help resources of Geographic Information System (GIS) software. For example, a search on the phrase “Adding raster datasets as attributes in a feature class” can be performed within the Esri ArcGIS help files or resource center to find additional information on how this can be performed.

- Callout title text stored in the FRD: Table Name: S_FRM_Callout_Ln, Field Name: IMG_TITLE

Figure A7: Callout Box and Leader Placement Guidance
• Callout descriptive text stored in the FRD: Table Name: S_FRM_Callout_Ln, Field Name: IMG_CPTION
• Callout descriptive text box: White Fill, Outline: Line weight 1 Pt., Black, 5 Pt. Margins
• Callout descriptive text box Size: Width 6” or 4”, Height will vary to fit the amount of text
• Callout descriptive text box is to be placed directly below Callout Image Box, center aligned with the Callout Image Box

2.1.3 AoMI Callout Symbology
Table A6 provides recommendations for the display of callout text and features on the FRM.

<table>
<thead>
<tr>
<th>Example</th>
<th>Feature</th>
<th>Recommendation* [Hatch Pattern] (RGB Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STREAM FLOW CONSTRICITION</td>
<td>Callout Title</td>
<td>17 Pt., Arial Bold, Aligned left and top, Black, 2 Pt. White Halo, CAPS</td>
</tr>
<tr>
<td></td>
<td>Callout Leader Line</td>
<td>Line weight 2.0 Pt, Black</td>
</tr>
<tr>
<td></td>
<td>Callout Image Box Frame</td>
<td>White (255, 255, 255) Outline, Line weight 1.0 Pt., Black (0, 0, 0)</td>
</tr>
<tr>
<td>In the flood study conducted, the culvert at Main Street is no longer capable of passing a storm greater than the 10%-annual-chance flood event.</td>
<td>Callout Caption Text</td>
<td>12 Pt., Arial, Aligned left, Black, CLC, 254 characters max</td>
</tr>
<tr>
<td></td>
<td>Callout Descriptive Text Frame</td>
<td>White (255, 255, 255) Outline, Line weight 1.0 Pt., Black (0, 0, 0) 5 Pt. Margins</td>
</tr>
</tbody>
</table>

Note: * Alternate fonts that emulate these recommendations may also be used

3.0 FRM Variations for Coastal Areas
For coastal projects, several minor variations can and should be applied when producing the FRM. Since different flood risk data may be produced as part of a coastal study, the callouts for a coastal FRM may reasonably be different from a typical watershed FRM.

Figure A8 shows an example of a Coastal FRM.
Figure A8: Example of a Flood Risk Map Developed for Coastal Areas
4.0 FRM Variations for Dams

Similar to coastal FRMs, for projects that have assessed the risks associated with a dam, several minor variations can and should be applied when producing the FRM. Since different flood risk data may be produced for dams, the callouts for a dam FRM may reasonably be different from a typical watershed FRM.

The project locator inset for dam analysis FRMs should include the location of the dam(s) and upstream and downstream inundation areas (if legible) in the context of the remainder of the watershed-based project. Figure A9 is an example project locator:

![Figure A9: Project Locator Inset Example for Dams](image)

Figure A10 provides an example of a dam FRM.
Figure A10: Example of a Flood Risk Map Developed for Dams
5.0 FRM Variations for Levees

In general, a FRM is anticipated to be produced for each levee scoped to be studied in the project area. However, if multiple levees are studied in close proximity to each other, a single FRM may be produced for multiple levees assuming that the flooding risk can be readily communicated on the combined map. The standard FRM legend should be modified to include any levee scenarios presented on the map.

Similar to the FRM for areas affected by dams, the project locator inset for levee analysis FRMs should include the location of the levee(s) and the major drainage feature in the context of the remainder of the watershed-based project. Figure A11 is an example levee project locator:

![Figure A11: Project Locator Inset Example for Levees](image)

Figure A12 provides an example of a levee FRM.
Figure A12: Example of a Flood Risk Map Developed for Levees