

Guidance for Flood Risk Analysis and Mapping

Flood Risk Map

November 2016



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.

For more information, please visit the FEMA Guidelines and Standards for Flood Risk Analysis and Mapping webpage (www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping). Copies of the Standards for Flood Risk Analysis and Mapping policy, related guidance, technical references, and other information about the guidelines and standards development process are all available here. You can also search directly by document title at www.fema.gov/library.

Table of Revisions

The following summary of changes details revisions to this document subsequent to its most recent version in May 2016.

Affected Section or Subsection	Date	Description
Sections 3.1 and 3.5 and their subsections	November 2016	In order to promote more flexibility and simplicity in the FRD, removed the implication that the S_Carto_Pt, S_Carto_Ln, S_Carto_Ar, and S_FRM_Callout_Ln feature classes must be used to store their respective features on the Flood Risk Map. The text was revised where necessary to indicate that these features classes can be optionally used, but are not required.

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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 (see Figure 1). The FRM is not a regulatory product. It is a tool designed to support a discussion of flood risk.

A single FRM is usually produced for each project area, although if multiple maps better communicate the flood risk within the project area, the Mapping Partner may produce multiple FRMs for the project. The FRM is also typically created along with the Flood Risk Report (FRR) and the Flood Risk Database (FRD). The FRM should present the most important information in the most public friendly format. For more detailed information, users can refer to the FRD.

2.0 Map Graphics and Layout

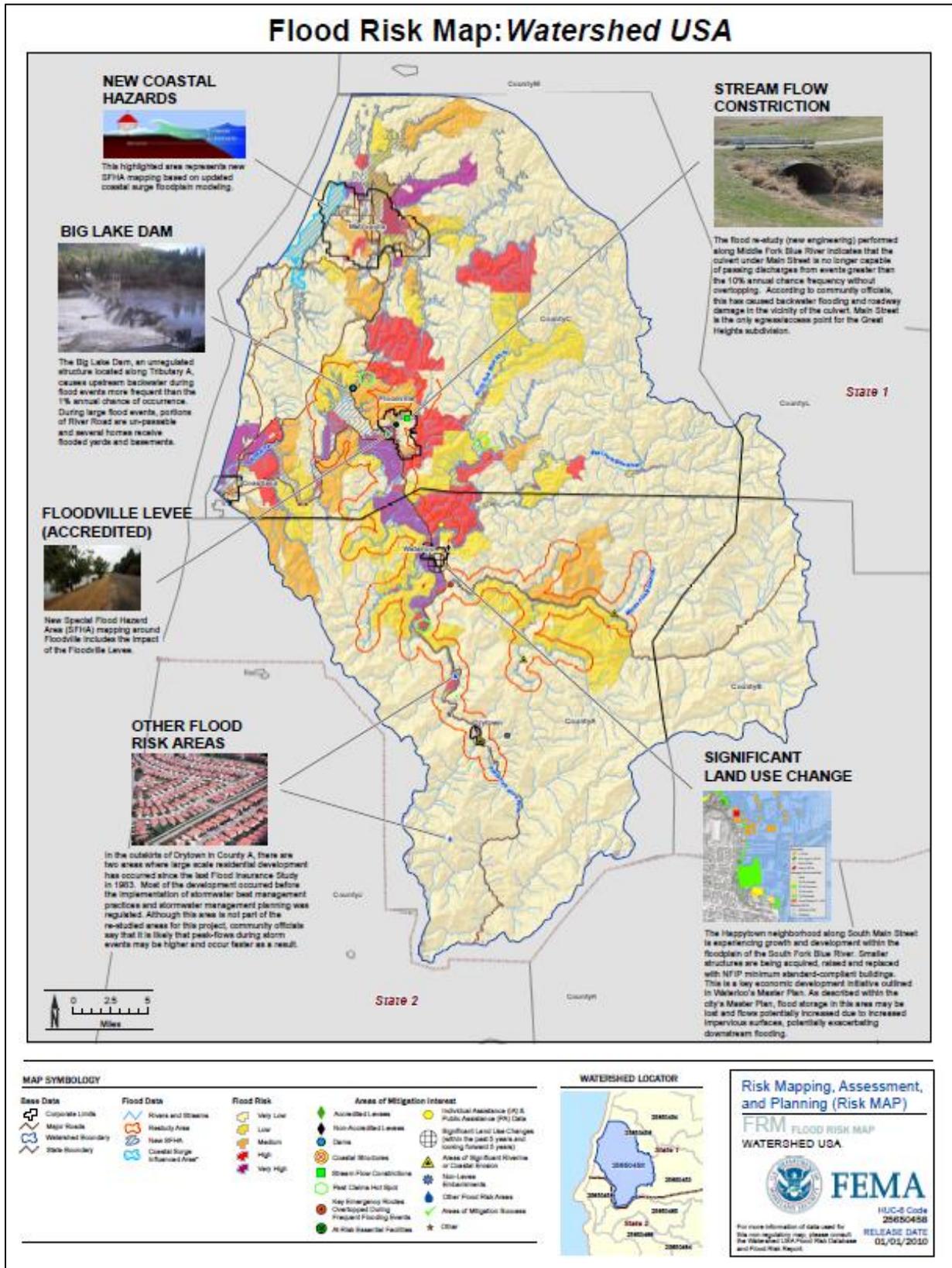
A template (Esri ArcMap MXD and MXT files) for the FRM can be downloaded at www.fema.gov/media-library/assets/documents/32786?id=7577. The MXD file has placeholders and symbology set up for all map data elements, font styles, and suggested call-out examples for FRM users to follow. However, it is important 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 communications or meet the community's needs better. The details below are therefore guidance only, but do provide a strong framework to enable Mapping Partners to develop a FRM that effectively communicates flood risk to project stakeholders.

2.1 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 1: Example of a Flood Risk Map Developed at the Watershed Level



2.2 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 2 and Figure 3, 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"

Figure 2: Map Dimensions (Portrait)

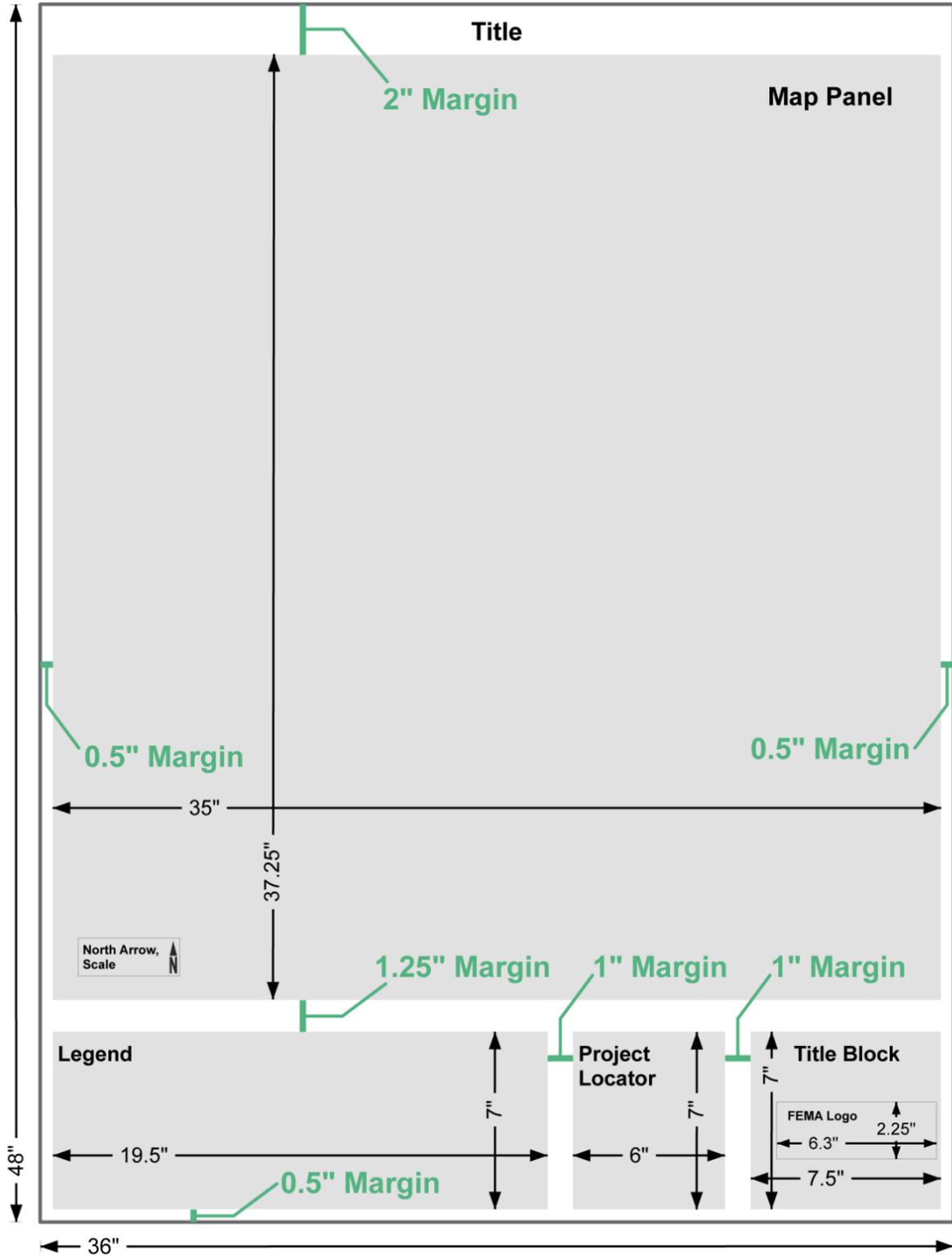
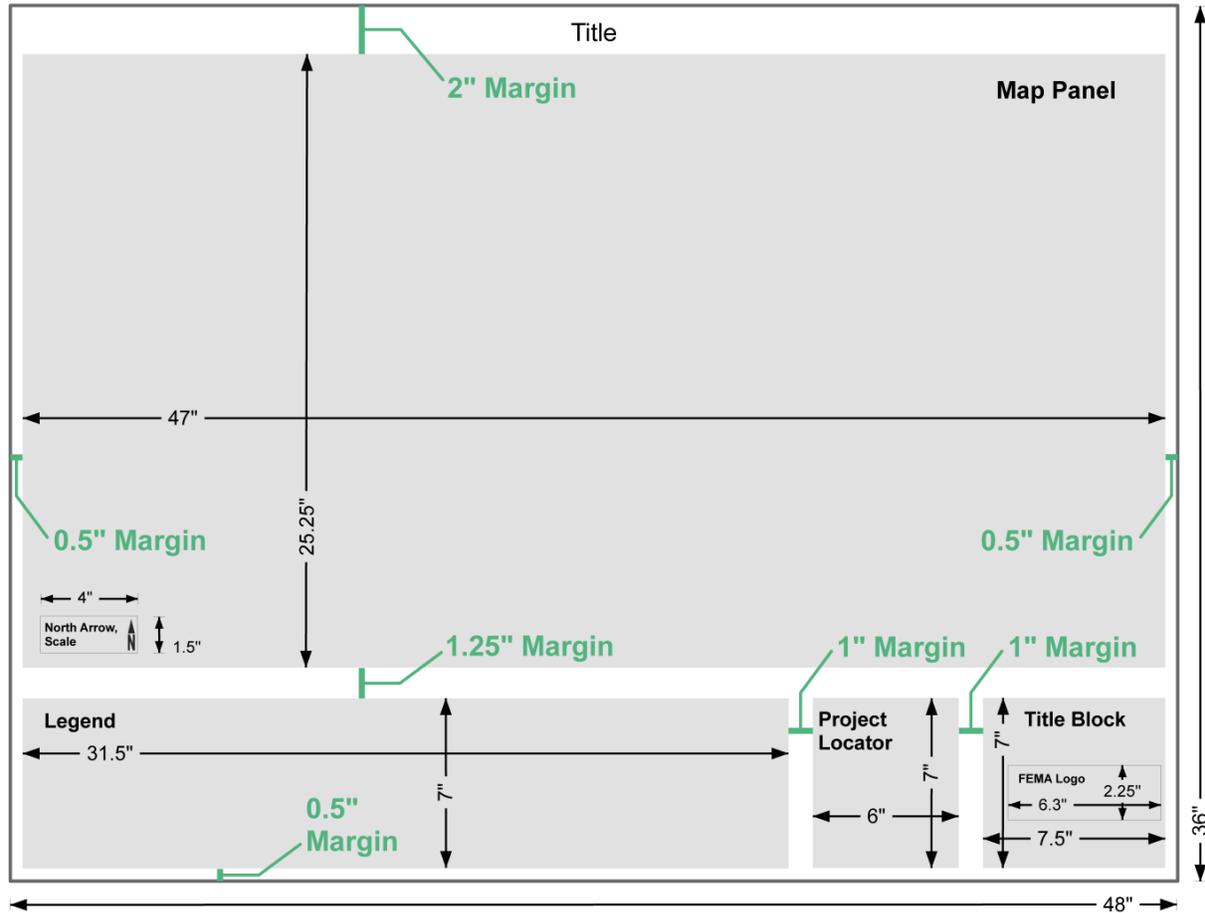


Figure 3: Map Dimensions (Landscape)



2.3 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.

2.4 Legend (Map Symbolology)

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 4). 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.

Figure 4: Map Legend Example

MAP SYMBOLOGY

Base Data	Flood Data	Flood Risk	Areas of Mitigation Interest
Corporate Limits	Rivers and Streams	Very Low	Accredited Levees
Major Roads	Restudy Area	Low	Non-Accredited Levees
Watershed Boundary	New SFHA	Medium	Dams
State Boundary	Coastal Surge Influenced Area*	High	Coastal Structures
		Very High	Stream Flow Constrictions
			Past Claims Hot Spot
			Key Emergency Routes Overtopped During Frequent Flooding Events
			At-Risk Essential Facilities
			Individual Assistance (IA) & Public Assistance (PA) Data
			Significant Land Use Changes (within the past 5 years and looking forward 5 years)
			Areas of Significant Riverine or Coastal Erosion
			Non-Levee Embankments
			Other Flood Risk Areas
			Areas of Mitigation Success
			Other

2.5 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 5):

- 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.

Figure 5: Locator Diagram Example

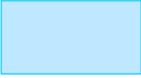


If applicable, the watersheds immediately adjacent (share a border) to the studied watershed should be numbered using their eight-digit Hydrologic Unit Code (HUC-8). If the study is not a sub-basin study (i.e., county-based, Coastal-only Project, Physical Map Revision (PMR), or projects consisting of 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 1.

Table 1: Recommended Project Locator Fonts and Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
PROJECT LOCATOR	Title	28 Pt., Franklin Gothic Medium, Aligned center, Black (0, 0, 0), CAPS
12345678	Project Area or Watershed Label	12-22 Pt., Arial Bold, Aligned center, Blue (0, 77, 168), 2 Pt. White Halo
12345678	Adjacent Watershed or County Label	10-14 Pt., Arial Bold, Italic, Aligned center, Black (0, 0, 0), 2 Pt. White Halo
State	State Label	12-22 Pt., Arial Bold, Italic, Aligned center, Brown (115, 0, 0), 2 Pt. White Halo, CLC
<i>Lake Erie</i>	Major Body of Water	10-14 Pt., Arial, Italic, Aligned center., Blue (0, 92, 230), CLC
	Project Area	Grey (225, 225, 225) Outline, Line weight 3 Pt., Grey (104, 104, 104)
	State	Yellow (255, 255, 173) Top Line, Line weight 2 Pt., Brown (115, 0, 0), Dashing [6pt- 4pt- 2pt- 4pt- 2pt- 4pt] Outline, Line weight 3 Pt., Grey (170, 170, 170) 50 percent Transparency
	Surrounding Watersheds or Counties	Outline, Line weight 3 Pt., Grey (204, 204, 204)

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	Major Body of Water	Blue (190, 232, 255) Outline, Line weight 0.4 Pt., Blue (0, 197, 255)
	Leader line	Line weight 2.0 Pt, Black

Note:

* Alternate fonts that emulate these recommendations may also be used

2.6 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 2 provides recommendations for the title block features.

Table 2: Recommended Title Block Fonts, Notes, and Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	Title Block Neatline	3 Pt. Black (0,0,0)
<p>Risk Mapping, Assessment, and Planning (Risk MAP)</p>	Risk MAP Header	40 Pt. Franklin Gothic Medium Cond, Blue (0, 82, 171), Aligned Left
	Dividing Line	3 Pt. Black (0,0,0) Horizontal Line, 6.9" Wide
<p>FRM_{FLOOD} RISK MAP</p>	FRM Header	56 Pt. Franklin Gothic Medium, (168, 194, 194), Aligned Left, CAPS 30 Pt. Franklin Gothic Medium, Grey (168, 194, 194) , Aligned Left, CAPS

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
 FEMA	Department of Homeland Security Seal Place this seal on the right side of the title block	Width: 6.3" Height: 2.25"
PROJECT NAME, HUC-8 Code	Project Name text (HUC-8 Code if applicable). Place this text below FRM Header.	28 Pt. Arial, Aligned Left, Black CAPS
RELEASE DATE 12/31/9999	Release date text. Place this text in the bottom right corner of the title block.	24 Pt. Franklin Gothic Medium Cond, Blue (0,82,171), Aligned Right, CAPS 26 Pt. Franklin Gothic Medium, Black, Aligned Right, CAPS
For more information on the data used for this map, please consult the Project Name Flood Risk Database and Flood Risk Report.	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.	16 Pt. Arial, Aligned Left, Black

Note:

* Alternate fonts that emulate these recommendations may also be used

2.7 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 3 gives a list of recommendations for the north arrow and scale features.

Table 3: Recommended North Arrow and Scale Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	<p>North arrow; can be ESRI standard or equivalent</p> <p>Place to the left of scale bar.</p>	<p>Line weight 0.72 Pt.</p> <p>Width 0.2219"</p> <p>Height 0.9819"</p> <p>Black</p>
	<p>Top and Bottom line</p>	<p>3 Pt. Black (0,0,0)</p> <p>Horizontal Line</p> <p>4" Wide</p>
	<p>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.</p> <p>Place within Map Panel frame in the bottom left, center or right.</p> <p>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.</p>	<p>Line weight 1.0 Pt.</p> <p>(Scale Bar [Miles])</p> <p>Length: 5", Black</p> <p>(Scale Bar Labels)</p> <p>22 Pt. Arial, Black CAPS</p>

Note:

* Alternate fonts that emulate these recommendations may also be used

2.8 Page Content

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

2.8.1 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.

2.8.2 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.

2.8.3 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 4 be followed.

Table 4: Overprinting Hierarchy

Rank	Item
Labels	
1	Rivers and Streams
2	Jurisdiction Labels
3	Transportation Features
Standard Map Elements	
1	Areas of Mitigation Interest
2	Callout Lines
3	Hydraulic Features
4	Restudy Area

Rank	Item
5	New Special Flood Hazard Area (SFHA)
6	HUC-8 Sub-basin Line
7	Coastal Surge Influenced Area
8	Corporate Limits
9	River and Stream Features
10	Lakes and Waterbody Areas
11	Transportation Features
12	Flood Risk Areas
13	HUC-8 Sub-basin Area
14	HUC-10 Watershed Area
15	County Areas
16	Hillshade
Boundaries	
1	HUC-8 Sub-basin Boundary
2	Community Boundary
3	County Boundary
4	State Boundary

2.8.4 Hierarchy for Labels and Map Features

Table 4 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.

2.8.5 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.

3.0 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.

There are two general categories of map features shown on the FRM: those that are associated with a flood risk dataset (such as Areas of Mitigation Interest, 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, etc.). For the latter category, although not required, all of these features can be stored within the S_Carto_Pt, S_Carto_Ln, or S_Carto_Ar layers of the Flood Risk Database, as this allows the database to be used to generate the Flood Risk Map. The S_Carto layers of the FRD were designed to be flexible enough to allow the user to expand the feature class through the use of user-defined features, which may help to enhance the communication capability of the FRM. If used, the S_Carto layers do not need to be clipped by the S_FRD_Proj_Ar polygon.

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. Base map features from one source may be clipped where they meet those from another source.

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 overall 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, and significant airports (where applicable)
- Hydraulic structures (i.e., levees, dams, and significant hydraulic structures)
- 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 4. The Mapping Partner can use leader lines as appropriate to reduce clutter. Cartographic recommendations for these features are outlined in Table 5.

3.1.1 Corporate Limits

Political entities (incorporated areas, areas of extraterritorial Jurisdiction, etc.) should be labeled with their formal name. When ETJs are significant enough to be labeled on a FIRM, they can also be shown on the FRM. In instances where the ETJ boundary resides outside the corporate limits, only the outermost boundary line should be shown and the area labeled with the community name.

All other areas, such as military and Tribal lands, State and national parks or forests are not required, but should be shown on the FRM if they are relevant to flood risk in the FRM project

area. These features should be labeled by name at least once. In crowded or segmented areas, these labels can be leadered, but leadering is not required.

When additional jurisdictions that fall outside the project area are needed for the FRM, those features should be shown on the FRM. The S_Carto_Ar feature class of the FRD can be used to store these features.

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. FEMA uses the HUC boundaries in the WBD to prioritize projects based on multiple criteria. The boundaries delivered should be those HUCs from the WBD used for the most recent FEMA prioritization.

The HUC-8 sub-basin boundary is the basis for the FRM, unless a different project area has been specified. This information should be pulled directly from the S_HUC_Ar feature class within the FRD. The HUC-10 watershed boundary can also be shown on the FRM. If displayed, this information should be stored in the S_HUC_Ar feature class within the FRD.

3.1.3 Transportation Features

Interstates, U.S. highways, State highways, and major airports should be shown and labeled on the FRM. Secondary roads can be shown if they would enhance the usability of the map. Road shield labels should be placed on the line it represents, and horizontal to the map frame. County highways, major roads, and other airports should be added for clarity at the Mapping Partner's discretion, as long as their addition does not render the map unreadable due to excessive clutter. Road name labels may be leadered into the feature 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, and can be stored within the S_Carto_Ln, S_Carto_Ar, or S_Carto_Pt feature classes in the FRD. A label may be placed if the structure(s) necessitate a label. The hydraulic structures can be stored as a point, line, or polygon in their respective feature classes (i.e., S_Carto_Ar, S_Carto_Ln or S_Carto_Pt).

3.1.5 Topographic Hillshade

The watershed hillshade should be shown on the 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 may be used to produce the hillshade layer.

3.1.6 FRM Base Data Symbology

Table 5: Recommended Base Data Fonts and Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
Boundaries		
	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)
	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
	Corporate Limits (within Watershed or Project Area)	Outline, Line weight 1.5 Pt., Black
	Corporate Limits (outside Watershed or Project Area)	Grey (204, 204, 204) Outline, Line weight 1.5 Pt., Grey (104, 104, 104) 50 Percent Transparency
	HUC-8 Sub-basin	Outline, Line weight 3 Pt., Blue (0, 77, 168)
	HUC-10 Watershed	Outline, Line weight 1 Pt., Grey (104, 104, 104) 20 Percent Transparency
<i>Flood County</i>	County Label	8-14 Pt. Times New Roman Bold, Italic, Aligned center., Black, Centered; 1.0 Pt. Halo, White, CLC
City, Village, or Other	Community Area Label	8-14 Pt. Times New Roman Bold, Black, Centered; 1.0 Pt. Halo, White, CLC
Fort Bragg Military Base	Area Label	14 Pt. Times New Roman, Bold, Black, Centered 1.0 Pt. White Halo, CLC

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
Transportation		
	Interstates	Top Line, line weight 1 Pt., White Bottom Line, line weight 2 Pt., Black
	Interstate Highway, can be ESRI standard or equivalent	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
	U.S. Highway Symbol, can be ESRI standard or equivalent	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
	State Highway Symbol, can be ESRI standard or equivalent	Circle Diameter 0.200" to 0.280" 8 Pt. Arial Bold Narrow, Black, 0.75 White Halo, CAPS Line weight 0.72 Pt., Black
	County Highway Symbol (optional), can be ESRI standard or equivalent	Rectangle Size .150" x .250" to 0.300" x 0.400" 8 Pt. Arial Bold Narrow, Black, 0.75 Pt. White Halo, CAPS Line weight 0.72 Pt., Black
	Major Roads	Top Line, Line weight 1 Pt., Yellow (255, 255, 190) Bottom Line, Line weight 2 Pt., Red (255, 0, 0)
SPRING CREEK LANE	Major Roads Label (optional)	8 Pt., Arial Bold, Black, Aligned left, 0.75 Pt. White Halo, CAPS
Dulles International Airport	Major Airport	12 Pt., Calibri Bold, Aligned center, Grey (78, 78, 78), 1 Pt. White Halo, CLC
Floodville Community Airport	Airport (optional)	8 Pt., Calibri Bold, Aligned center, Grey (78, 78, 78), 1 Pt. White Halo, CLC

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
Hydraulic Structures		
	Levees, (or other flood control structures) represented as line features	Top Line, Black, Line weight 1.5 Pt., Dashing [2pt - 1pt] Bottom Line, Line weight 2 Pt., White, Dashing [2pt - 1pt]
	Dams (if not included as an AOMI)	Circle Marker, 0.06" Diameter, Black Outline, Line weight 0.1 Pt., White (255, 255, 255)
	Significant Hydraulic Structures	Top Circle Marker, 0.05" Diameter, (255, 0, 197) Bottom Circle Marker, 0.06" Diameter, Black Outline, Line weight 0.1 Pt., White (255, 255, 255)
STRUCTURE NAME	Structures Label (optional)	8 Pt., Arial Bold, Black, Aligned left, 0.75 Pt. White Halo, CAPS
Hillshade		
Value  High : 255 Low : 0	Watershed Hillshade	Black to White color ramp (High : 254, Low : 0) Hillshade Effect : Z:1 Stretch Type: Standard Deviations, n:2 30 Percent Transparency

Note:

* Alternate fonts that emulate these recommendations may also be used

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 hydrographic features are presented in Table 6.

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 Restudy Areas

Restudy areas are a buffer of the newly studied stream centerlines. The buffer should be approximately 0.25” measured at map panel scale on the FRM, although this can be modified to avoid crowding.

3.2.3 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.

3.2.4 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.

3.2.5 FRM Flood Hazard Data Symbology

Table 6: Recommended Flood Hazard Data Fonts and Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	River, Stream, or Other Hydrographic Feature	Line weight 1 Pt., Blue (151, 219, 242)
	Lake	Blue (151, 219, 242) Outline, Line weight 0.4 Pt., Blue (64, 101, 235) 50 Percent Transparency
<i>Missouri Creek</i>	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
	Restudy Area	Top Line, Line weight 1.5 Pt., Orange (255, 85, 0) Bottom Line, Line weight 3 Pt., Yellow (255, 255, 0)
	New SFHA	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”

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	River, Stream, or Other Hydrographic Feature	Line weight 1 Pt., Blue (151, 219, 242)
	Lake	Blue (151, 219, 242) Outline, Line weight 0.4 Pt., Blue (64, 101, 235) 50 Percent Transparency
	Coastal Surge Influenced Area	Area pattern #1, Line weight 1.5 Pt., Blue (115, 223, 255), Angle 135 degrees, Offset 0, Separation 0.2” Area pattern #2, Line weight 1.5 Pt., Blue (115, 223, 255), Angle 135 degrees, Offset 0, Separation 0.2”

Note:

* Alternate fonts that emulate these recommendations may also be used

3.3 Flood Risk Data

The objective of the flood risk data layer shown on the FRM is to show the dollar exposure 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 Asset Loss Total values from the Risk Analysis Results table and symbolized at the census block level (field TOT_LOSSES in table L_RA_Results, linked to S_CenBlk_Ar). The 1% 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.

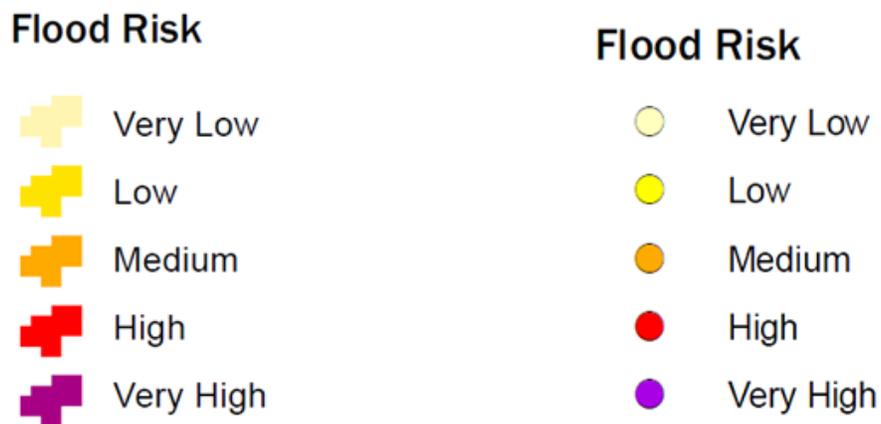
Two different types of Census block data can be stored in the FRD. Beginning with Hazus 2.2 SP1, the Hazus model provided the user the ability to conduct analysis for either homogenous or dasymetric census blocks. Homogenous census blocks represents the “full” census blocks traditionally used for risk 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. Multiple approaches,

however, 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, 5 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.

Figure 6: Flood Risk Legend Examples for Census-Block (left) and Site-Specific (right) Data



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% transparency for each).

3.4 Areas of Mitigation Interest

Specific guidance exists that outlines the collection and creation process for the Areas of Mitigation Interest 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. There may, therefore, be 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 7 provides suggestions for the symbolization of this data on the map.

Table 7: Recommended Areas of Mitigation Interest Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	Accredited Levees	Diamond Marker – 28 Pt., Green (56, 168, 0) 2 Pt. White Halo
	Non-accredited Levees	Diamond Marker – 28 Pt., Black 2 Pt. White Halo
	Dams	Circle Marker – 17 Pt., Blue (0, 169, 230) Outline, 1 Pt., Black
	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)
	Stream Flow Constriction	Square Marker Outline – 21 Pt., Black Square Marker – 21 Pt., Green (0, 255, 0)
	Past Claims Hot Spot	Hexagon Symbol Outline – 76 Pt., Green (85, 255, 0) Hexagon Symbol Outline – 80 Pt., Green (211, 255, 190)
	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)
	At-Risk Essential Facilities	Circle Marker Outline -20.57 Pt., Black Circle Marker – 20.57 Pt., Green (85, 255, 0)
	Individual Assistance (IA) and Public Assistance (PA) Data	Circle Marker Outline – 22 Pt., Black Circle Marker – 22 Pt., Yellow (255, 255, 0)
	Significant Land Use Changes (within the past 5 years and looking forward 5 years)	Symbol Hatch Marker – 80 Pt., Black

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
	Areas of Significant Riverine or Coastal Erosion	Triangle Symbol Marker – 22 Pt., Black Triangle Marker – 22 Pt., Yellow (255, 255, 0)
	Non-Levee Embankments	Symbol Marker Outline – 24 Pt., Black Symbol Marker – 24 Pt., Blue (115, 178, 255)
	Other Flood Risk Areas	Symbol Marker – 23.81 Pt., Blue (0, 92, 230) Symbol Marker – 30 Pt., White
	Areas of Mitigation Success	Symbol Marker – 28 Pt., Green (85, 255, 0) 1 Pt. White Halo
	Other	Symbol Marker Outline – 30 Pt., Black Symbol Marker – 30 Pt., Orange (255, 170, 0)

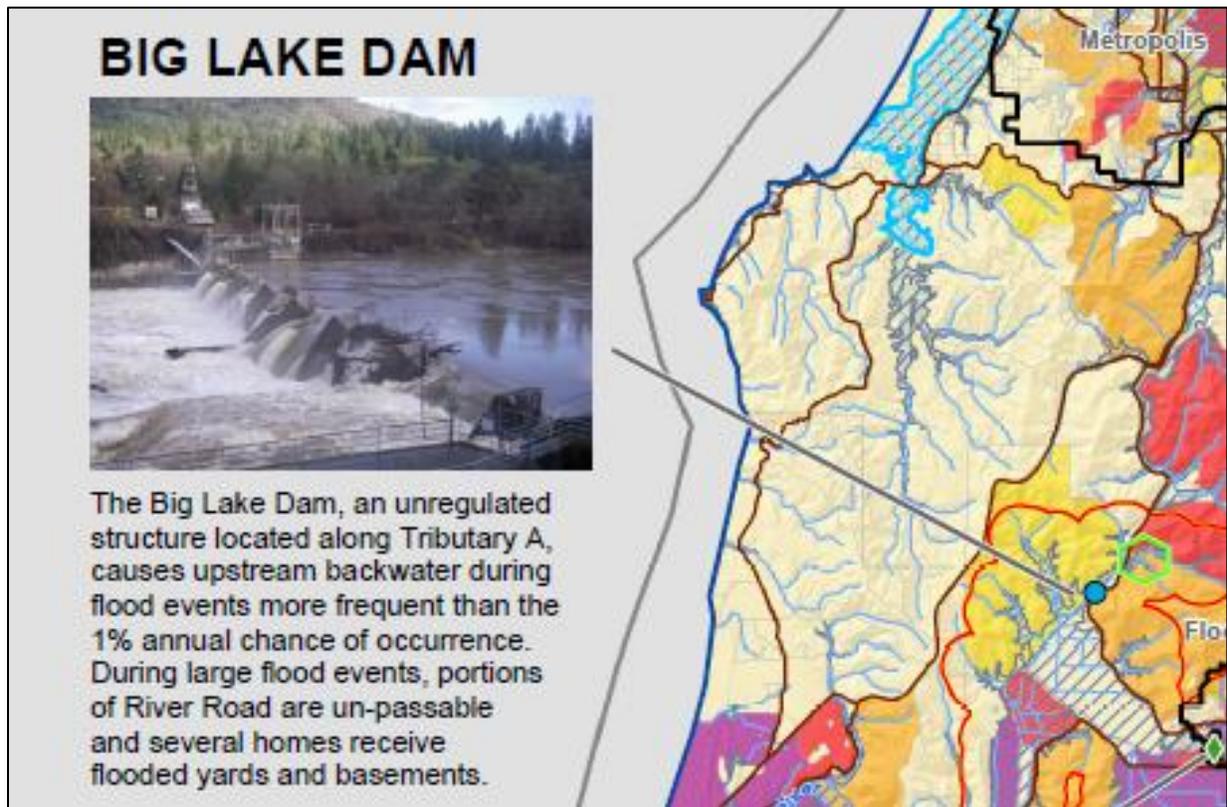
Note:

* Alternate fonts that emulate these recommendations may also be used

3.5 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 7). 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.

Figure 7: Example of an AoMI Callout

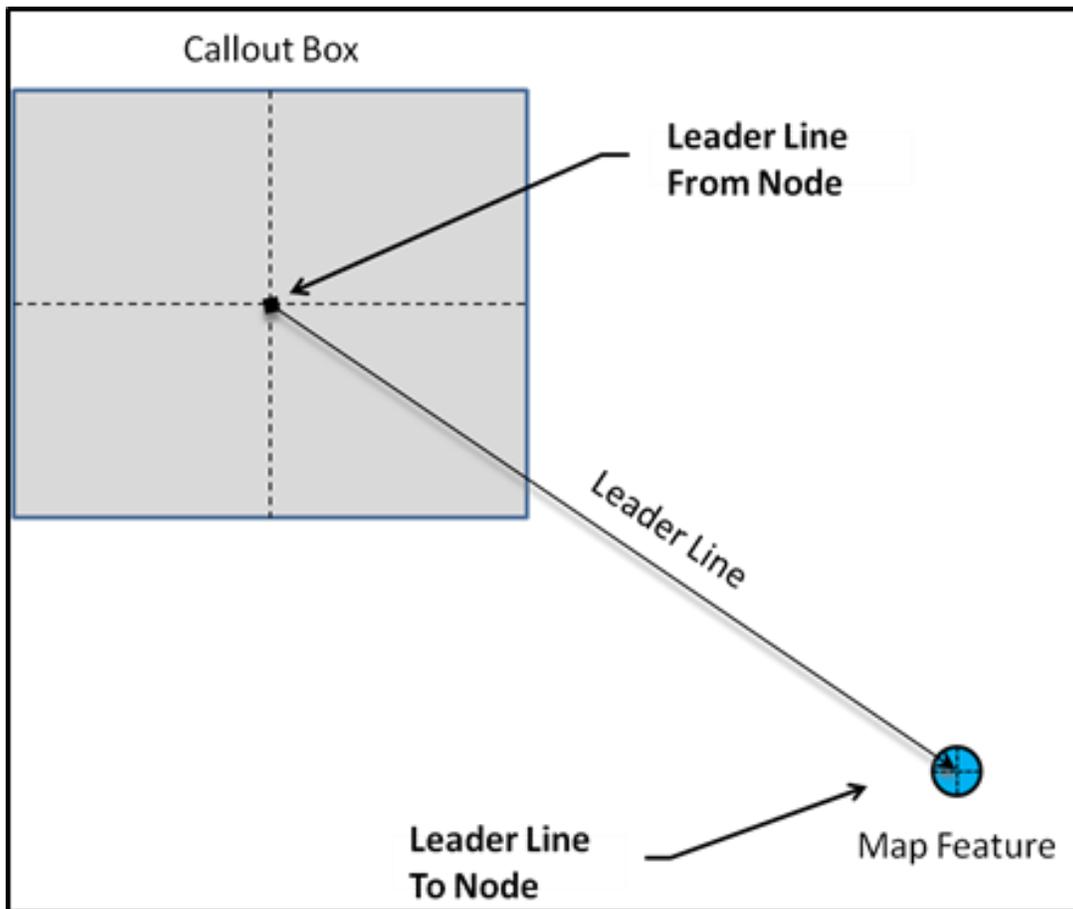


General guidance and recommendations on the placement of callouts follows, but as with all guidance, variations to this may be implemented if doing so would enhance the overall product (see Figure 8).

3.5.1 S_FRM_Callout_Ln

Callouts are shown on the FRM, and can be stored in the S_FRM_Callout_Ln feature class 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 S_FRM_Callout_Ln feature class within the FRD can depict where the callout is to be placed on the map. 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).

Figure 8: Callout Box and Leader Placement Guidance



3.5.2 Callout FRD-Related Guidance

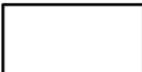
- Callout Image:
 - Callout Height stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_HEIGHT
 - Callout Width stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_WIDTH
 - Format: 300 dpi, 24-bit depth
 - Storage: Stored in the FRD: Table Name S_FRM_Callout_Ln, Field Name: IMG_BINARY – 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

- 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

3.5.3 AoMI Callout Symbology

Table 8 provides recommendations for the display of callout text and features on the FRM.

Table 8: Recommendations for Callout Fonts and Symbology

Example	Feature	Recommendation* [Hatch Pattern] (RGB Values)
AREA OF MITIGATION SUCCESS	Callout Title	17 Pt., Arial Bold, Aligned left and top, Black, 2 Pt. White Halo, CAPS
	Callout Leader Line	Line weight 2.0 Pt, Black
	Callout Image Box Frame	White (255, 255, 255) Outline, Line weight 1.0 Pt., Black (0, 0, 0)
In the southeast area of Swan Lake, several repetitive loss properties were acquired through the Hazard Mitigation Grant Program.	Callout Caption Text	12 Pt., Arial, Aligned left, Black, CLC, 254 characters max
	Callout Descriptive Text Frame	White (255, 255, 255) Outline, Line weight 1.0 Pt., Black (0, 0, 0) 5 Pt. Margins

Note:

* Alternate fonts that emulate these recommendations may also be used

4.0 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 and AoMIs for a coastal FRM may reasonably be different from a typical watershed FRM.

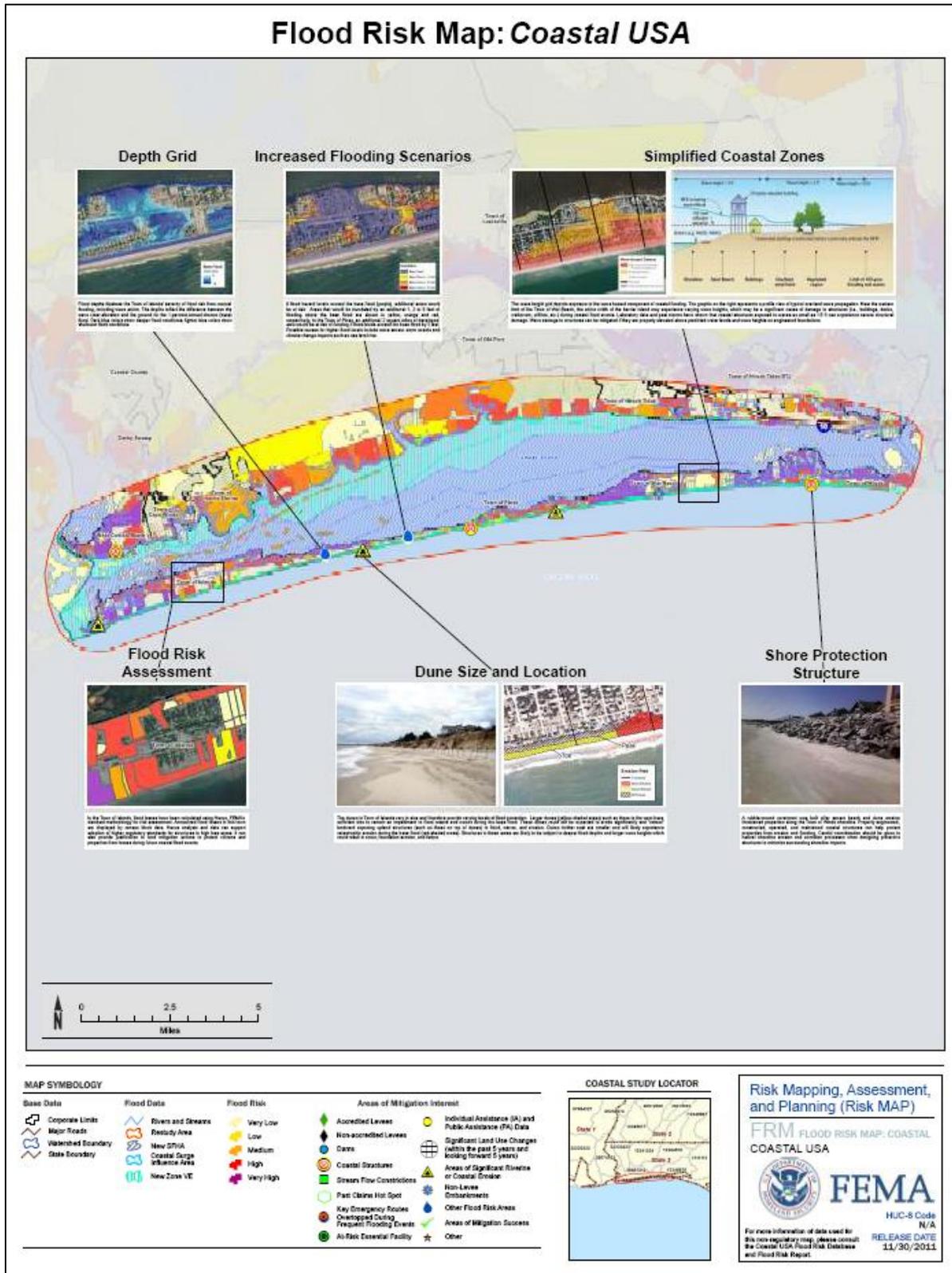
The legend for the coastal FRM should show any new VE Zones if they were produced for the study. Table 9 shows the recommended symbology for the depiction of these features on the FRM.

Table 9: Recommended Symbology for Coastal-Specific Legend Features

Example	Feature	Specification [Hatch Pattern] (RGB Values)
	New Zone VE	Line weight 2 Pt., Cyan (0, 255, 197), Angle 90 degrees, Offset 0, Separation 9

Figure 9 shows an example of a Coastal FRM.

Figure 9: Example of a Flood Risk Map Developed for Coastal Areas



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 callouts and 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 map.

The standard FRM legend should be modified to include any inundation scenarios presented on the map. The following figure is an example legend for different upstream and downstream scenarios:

Figure 10: Inundation Scenario Legend Example



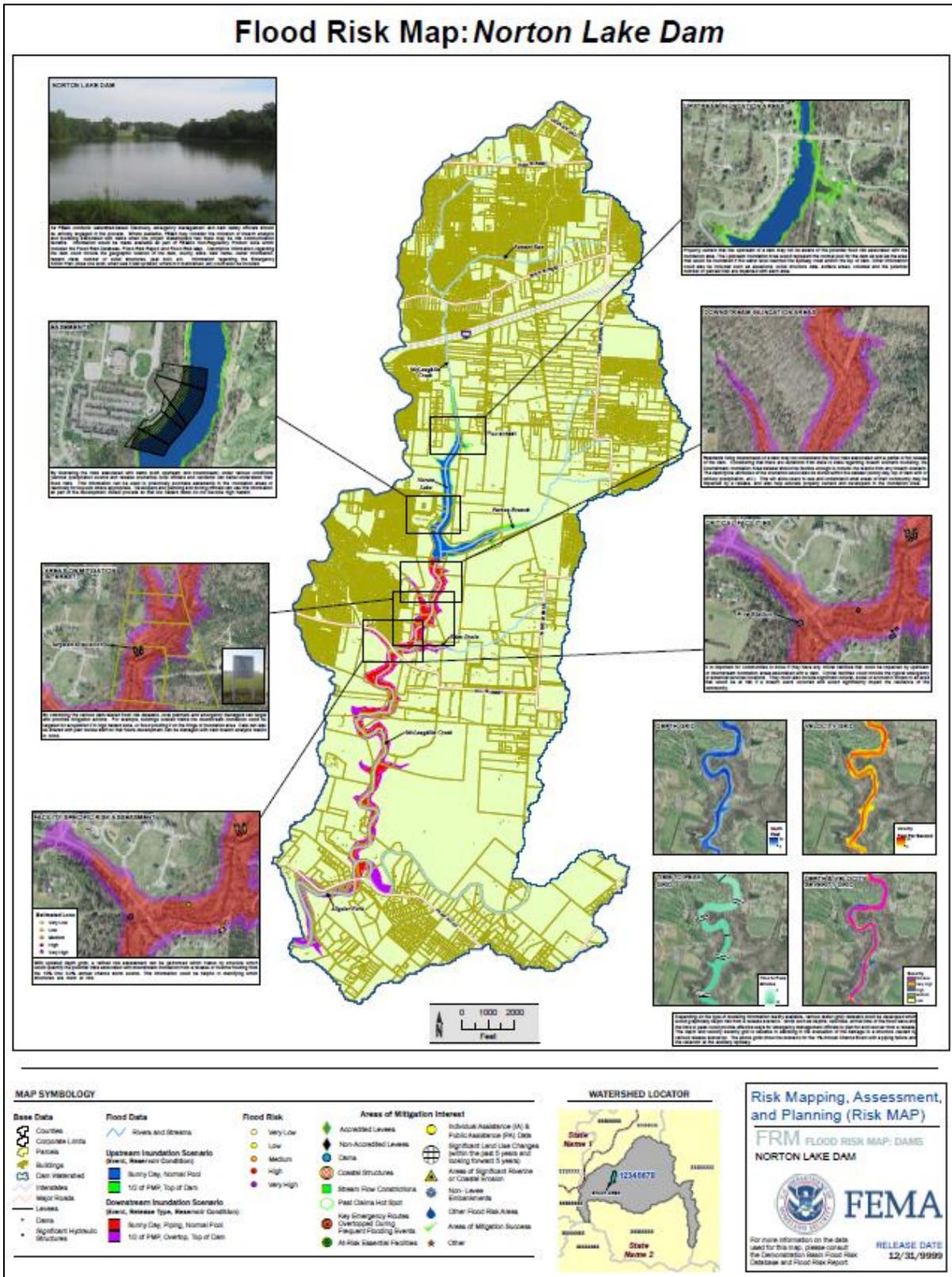
The project locator inset for dam analysis FRMs should include the location of the dam(s) and upstream and downstream inundation areas (if legible) in the context of the remainder of the watershed-based project. Figure 11 is an example project locator:

Figure 11: Project Locator Inset Example for Dams



Figure 12 provides an example of a dam FRM.

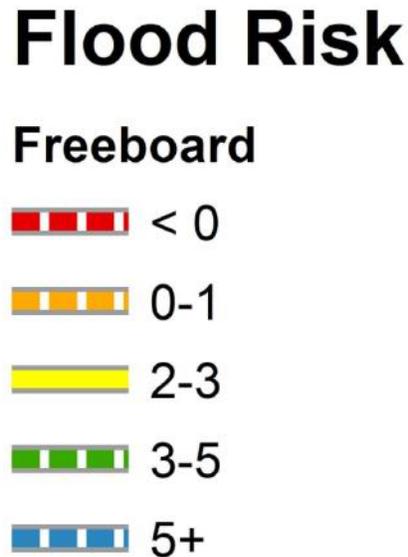
Figure 12: Example of a Flood Risk Map Developed for Dams



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 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. If levee freeboard is shown on the primary map, Figure 13 shows an example for adding this to the Flood Risk section of the legend.

Figure 13: 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 included within the Areas of Mitigation Interest section of the legend. Figure 14 provides an example of how this could be shown.

Figure 14: Levee Areas of Mitigation Interest Legend Example



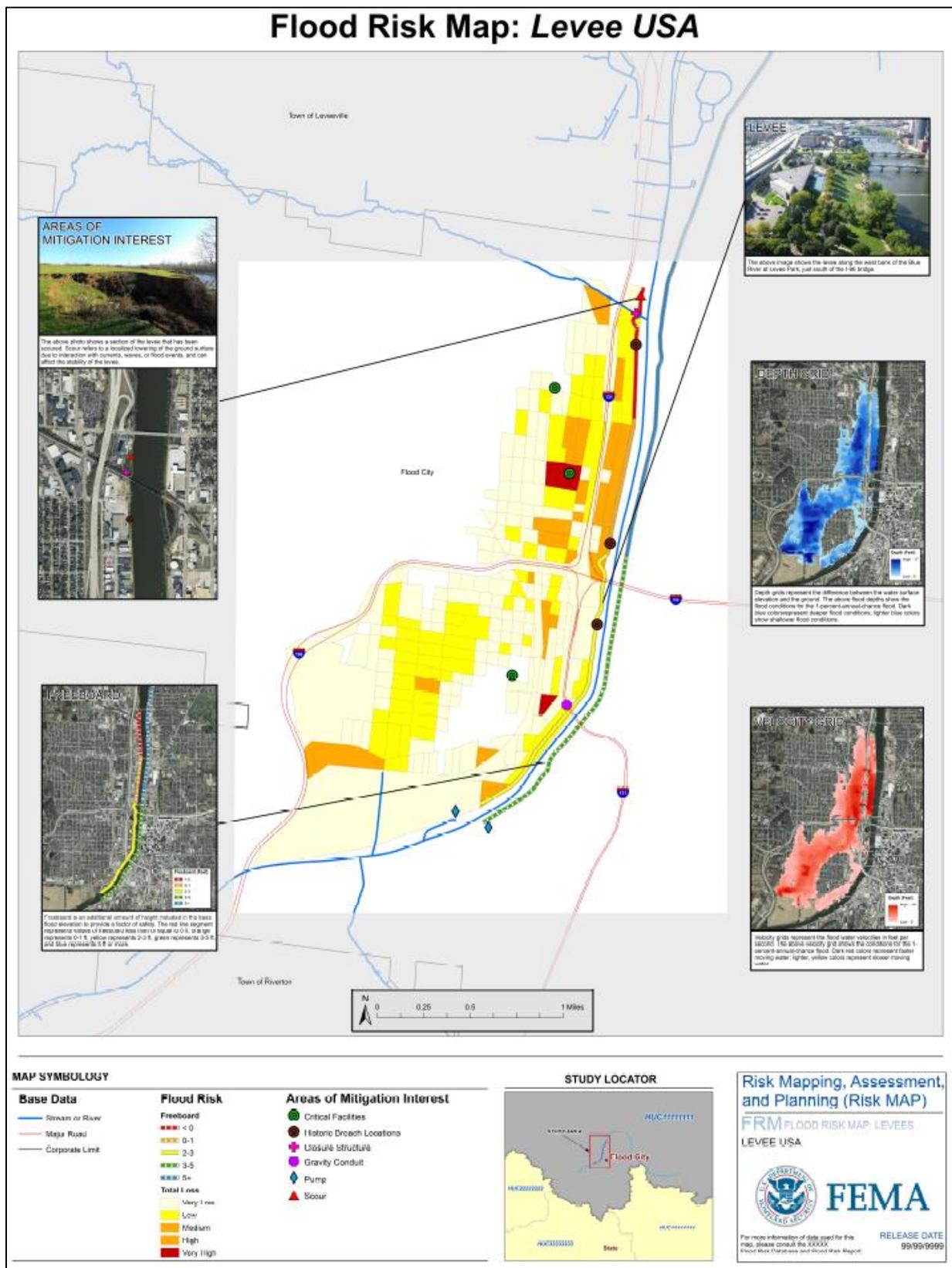
Similar to the FRM for areas affected by dams, the project locator inset for levee analysis FRMs should include the location of the levee(s) and the major drainage feature in the context of the remainder of the watershed-based project. Figure 15 is an example levee project locator:

Figure 15: Project Locator Inset Example for Levees



Figure 16 provides an example of a levee FRM.

Figure 16: Example of a Flood Risk Map Developed for Levees



7.0 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 Flood Risk Map 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.