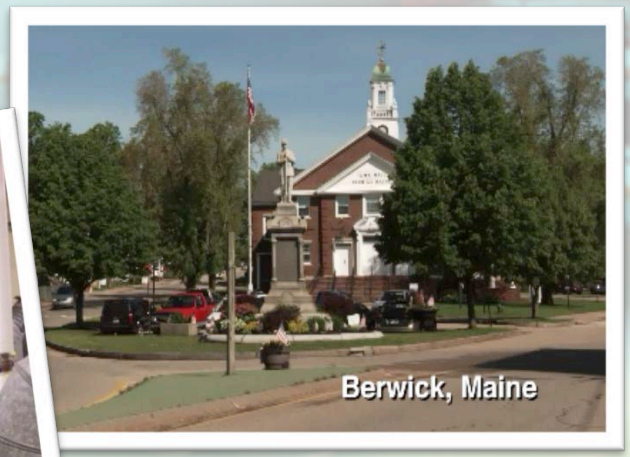
EPA
United States
Environmental Protection
Agency

Flood Resilience: A Basic Guide for Water and Wastewater Utilities



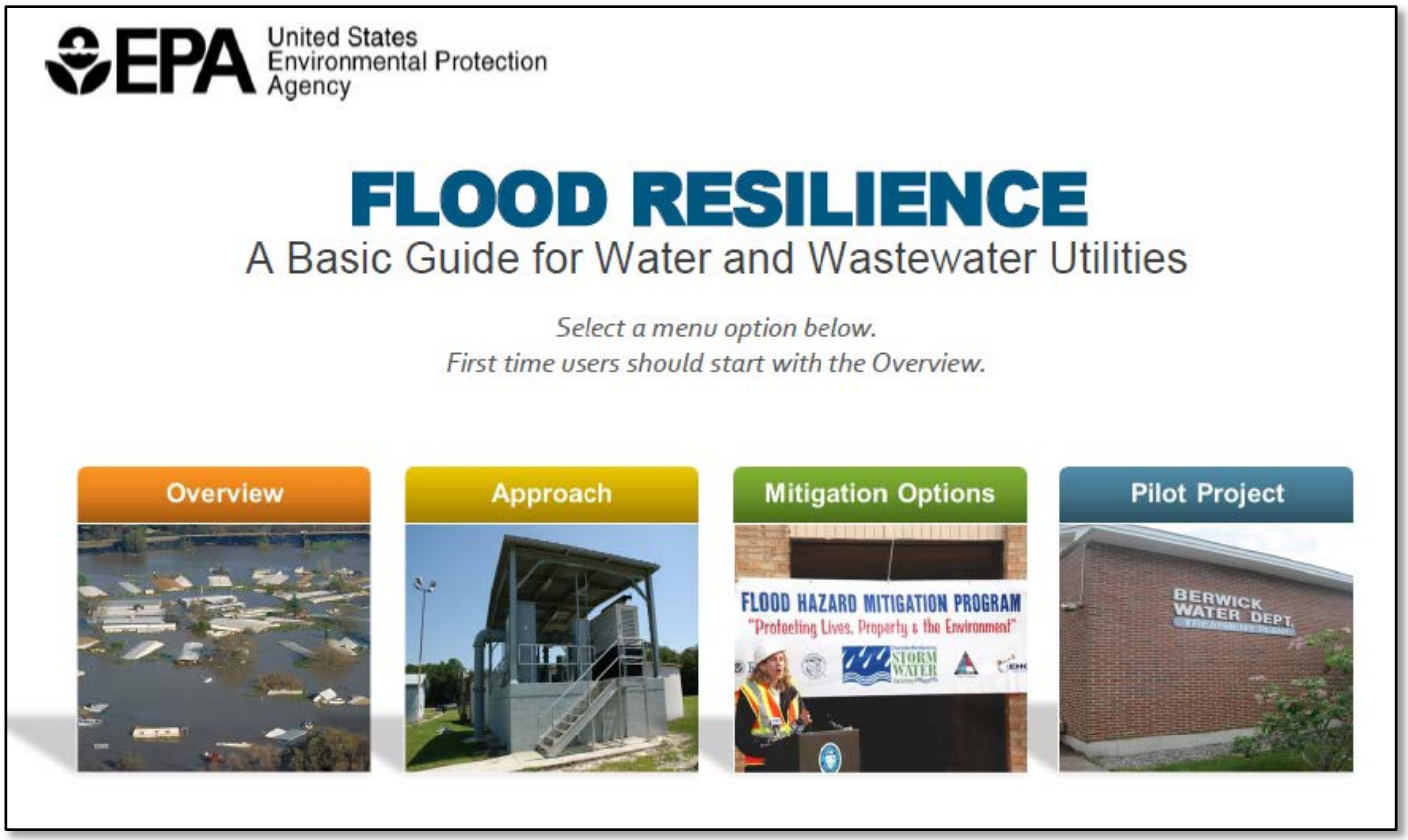
NEWEA
Annual Conference
Boston, MA

Mark Sceery
U. S. EPA – Region 1
January 27, 2015

Flood Resilience
A Basic Guide for Water and wastewater Utilities

NEW!

- With a user-friendly layout, the Guide provides *worksheets*, *instructional videos*, and *flood maps* to help utilities through a simple, 4-step process!



http://water.epa.gov/infrastructure/watersecurity/emerplan/upload/epa817b14006.pdf

Flood Resilience
A Basic Guide for Water and wastewater Utilities

Approach to Flood Resilience

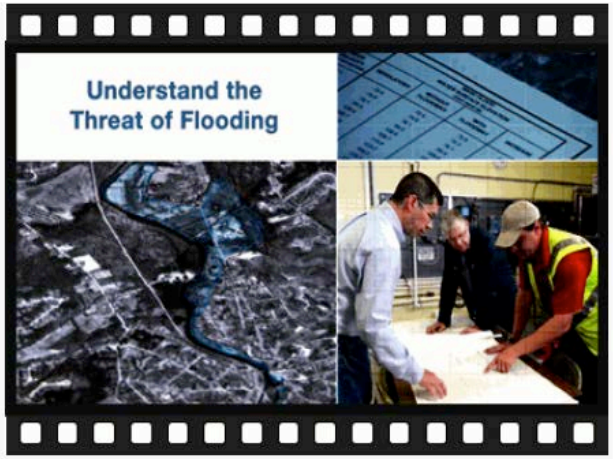
FIGURE 1: STEPS TO BECOME MORE RESILIENT TO FLOODING

STEP 1 Understand the Threat of Flooding → **STEP 2** Identify Vulnerable Assets & Determine Consequences → **STEP 3** Identify & Evaluate Mitigation Measures → **STEP 4** Develop Plan to Implement Mitigation Measures

Click on each step.

STEP 1: UNDERSTAND THE THREAT OF FLOODING

Flooding depends on various factors including rainfall, topography, river-flow, drainage and tidal-surge. The threat of flooding is based on the likelihood that such a flooding event will occur. Learn how the Berwick Water Department (BWD) evaluated their threat of flooding from the video link. Also, the Federal Emergency Management Agency (FEMA) is a resource to help you. FEMA produces maps of a "100-year flood" (a flood event that has a one percent chance of occurring in a given year) and a more catastrophic "500-year flood" (a flood event that has a two tenths of a percent chance of occurring in a given year). Click on the Step 1 worksheet icon below so that you can document the flooding threat and obtain FEMA Flood Maps.



Select the image to view the video.

Worksheet

STEP 1: Worksheet

To better understand the threat of flooding, your utility should first examine historical flooding data and review Federal Emergency Management Agency (FEMA) Flood Maps. Below ar instructions for evaluating the threat of flooding at your utility

To assist you, there are example tables completed with sample data.
Click on the icon to the right to open blank tables for you to input your utility's data.

1.1 Have you reviewed utility records of past flooding events? ☐ Yes ☐ No

If no, review how past flooding events have threatened your utility. Use various sources, including utility records, newspapers, websites and hazard mitigation experts, to collect previous flooding data. Enter your utility's past flooding information into Table 1.

EXAMPLE OF COMPLETED TABLE 1 – PAST FLOODING EVENTS

Event Information (e.g., Date, Name, Type*, Flood Elevation)	Description of Damage (Operational, Public Health, & Economic Impacts)
April 2007, "Patriot's Day Storm," Nor'easter, 238.5 ft	Collapsed water storage tank and damage to pump stations and chemical storage. Operated on backup power generator. Boil water notice issued for several days. Financial impacts were roughly $100,000.

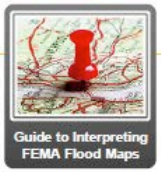
** Tropical storm, hurricane, spring thaw/snowmelt, levee failure, etc.*

1.2 What potential sources of flooding could impact your utility?

- ☐ Swollen rivers/streams
- ☐ Costal flooding
- ☐ Spring taw
- ☐ Flash floods
- ☐ Levee/dam failure
- ☐ Non-natural causes (e.g., main breaks)

1.3 Have you obtained FEMA Flood Maps? ☐ Yes ☐ No

If no, go to the Map Service Center to find FEMA Flood Maps, categorized by community. Flood Maps show areas that will be affected by both 100-year and 500-year floods. A "100-year flood" is a flood event that has a one percent chance of occurring in a given year. A "500-year flood" is a flood event that has a two tenths percent chance of occurring in a given year. Click on the icon to learn more about interpreting a Flood Map. If your Flood Map is not up to date, talk with your local community planning department or floodplain manager.


Guide to Interpreting FEMA Flood Maps

1.4 Identify which floodplains your utility systems are located within.

Locate your utility systems, such as intake, treatment, distribution, storage tank and pump stations, on your community's Flood Map to determine which floodplains they are located within. Summarize your findings in Table 2.

Previous | Main Menu | Next

Table 2 –
UTILITY SYSTEMS WITHIN FLOODPLAIN (FROM STEP 1)

Utility Systems	100-year Floodplain Elevation (_____ ft)	500-year Floodplain Elevation (_____ ft)
Intake (_____ ft)		
Treatment (_____ ft)		
Distribution/Collection (_____ ft)		
Storage Tank (_____ ft)		
Pump Stations (_____ft)		

FLOOD RESILIENCE: A Basic Guide for Water and Wastewater Utilities

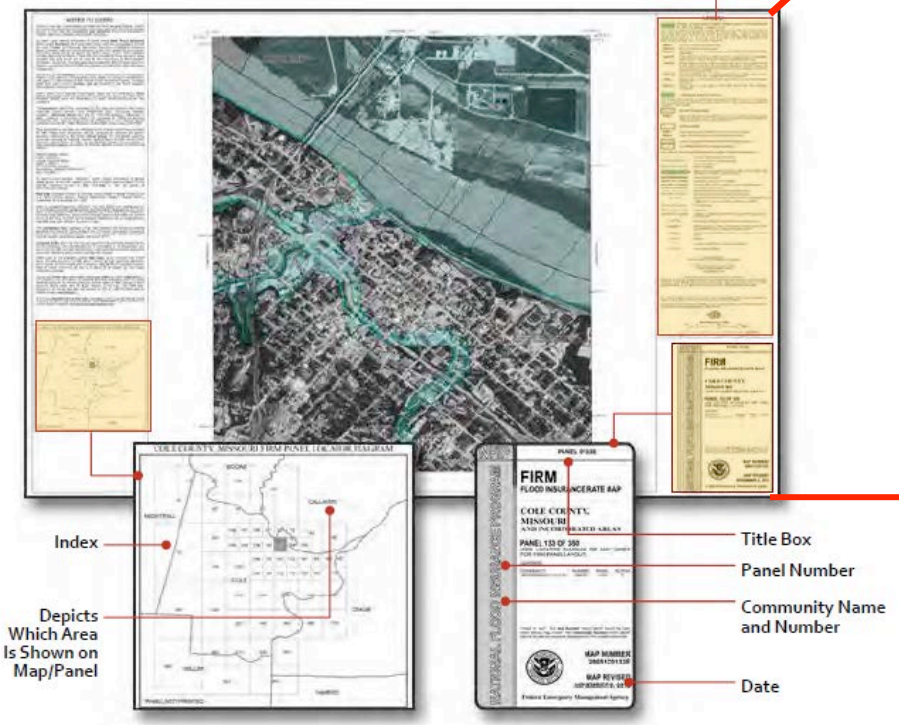
Return to Step 1 Worksheet

Interpreting FEMA Flood Maps

FLOOD MAP

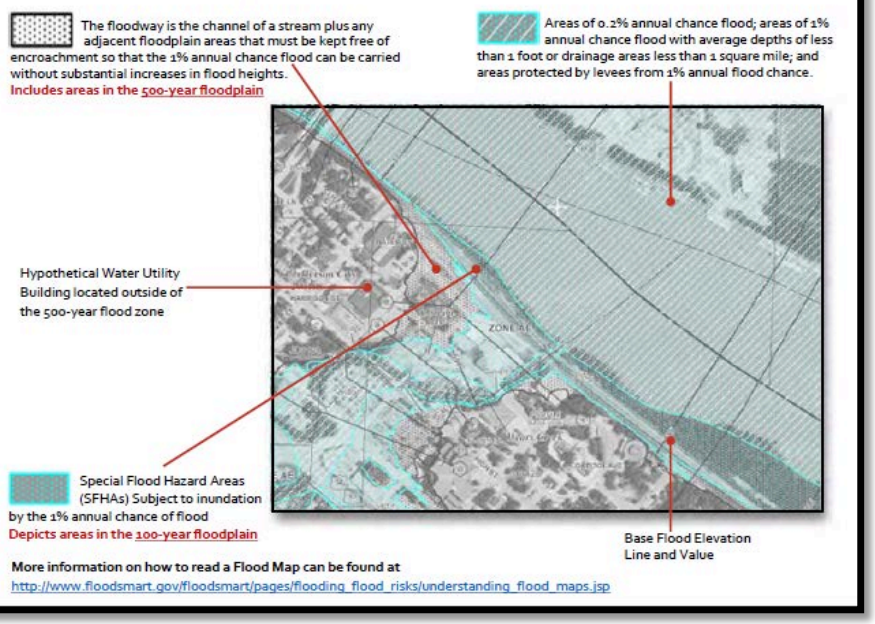
Flood Map is the common term used to refer to a Flood Insurance Rate Map (FIRM) developed by FEMA. Local and state governments use these maps to understand the threat of flooding and to devise hazard mitigation plans (including possible projects) to mitigate the effects of flooding in their communities. Flood Maps can be obtained through FEMA's Map Service Center. To identify your relevant Flood Map, enter the address of your facility or vulnerable asset(s). An example map including legend, index and title box is provided in Figure 2.

FIGURE 2: EXAMPLE FLOOD MAP – JEFFERSON CITY, MISSOURI

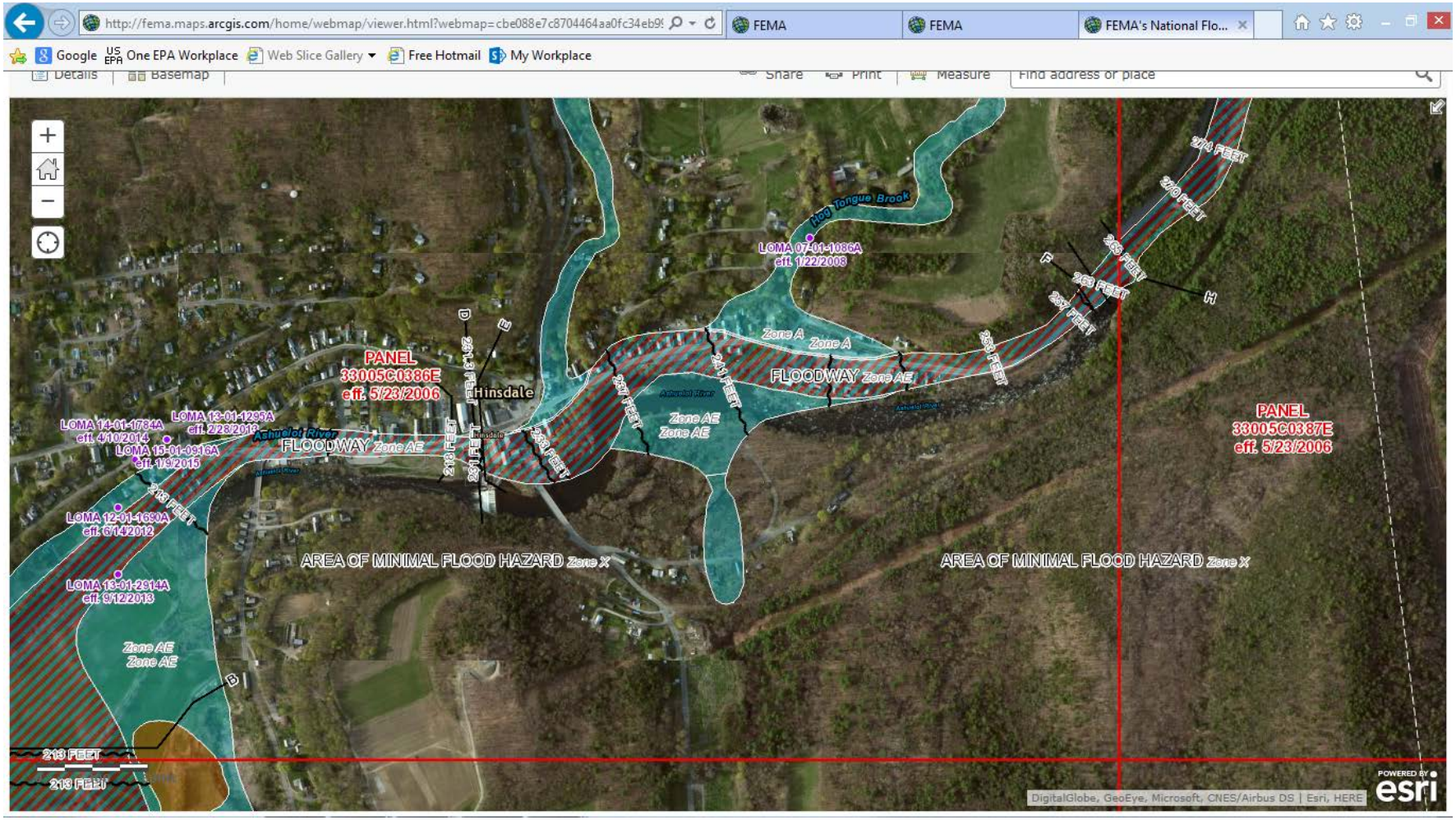


Previous | Main Menu | Next

FIGURE 3: CLOSE-UP OF EXAMPLE FLOOD MAP



Design Flood Elevation



http://fema.maps.arcgis.com/home

MITIGATION OPTIONS FOR SPECIFIC ASSETS/OPERATIONS

Click the photographs of assets/operations at drinking water (DW) and wastewater (WW) to get tables of flood mitigation measures for that specific asset/operation.

DW Assets


Water Intake, Distribution and Storage


Booster Stations and Other Pumps


Drinking Water Treatment Plant

DW & WW Assets


Buildings


Chemical and Other Storage


Instrumentation and Electrical Controls


Power Supply

WW Assets


Lift Stations


Headworks


Wastewater Treatment Plant

Previous | Main Menu | Next

Mitigation Options

BOOSTER STATIONS AND OTHER PUMPS

☑ Drinking water

Flood waters can severely damage pumps, thereby impacting the entire drinking water system from intake through distribution. Similarly, loss of facility power could render pumps inoperable without adequate backup power. Vulnerable water facility control systems include pump controls, variable frequency drives, electrical panels, motor control centers and Supervisory Control and Data Acquisition (SCADA) systems.

See the following checklist for potential flood mitigation option

✓	Mitigation Options for Booster Stations and Other Pumps	Cost
1. Prevent booster stations from flooding.		
	a) Procure temporary flood barriers (e.g., sandbags) for use in minor floods.	$
	b) Install permanent physical barriers (e.g., flood walls, levees, sealed doors).	$$
2. Protect critical components if booster stations do flood.		
	a) During upgrades or design of new equipment, develop capability to temporarily remove and safely store vulnerable components in advance of a flood.	$-$$$
	b) Waterproof, relocate or elevate motor controls, variable frequency drives, computers and electrical panels to a higher elevation by constructing platforms or integrating controls into existing buildings or infrastructure on-site.	$$
	c) De-energize systems prior to flooding to mitigate damage to electrical components.	$
	d) Replace non-submersible pumps with submersible pumps, if cost effective.	$$-$$$
	e) Replace standard electrical conduits with sealed, waterproof conduits. Replace	$$$

Now, for a look at the real thing

http://water.epa.gov/infrastructure/watersecurity/emerplan/upload/epa817b14006.pdf

GO PATS!!!