FEMA Benefit-Cost Analysis (BCA)

MEMA Building Resilient Infrastructure and Communities (BRIC) Program – FY21 BCA Overview

MASSACHUSETTS HAZARD MITIGATION

SNC·LAVALIN

ATKINS
Member of the SNC-Lavalin Group

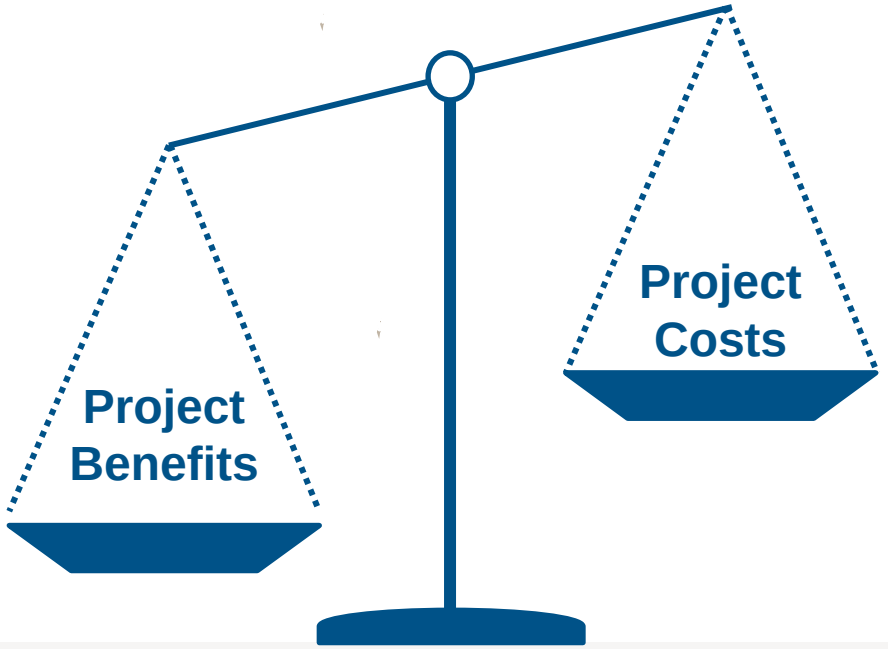
Objectives

1. Understand why BCAs are needed to complete a mitigation grant application
2. Know where to download FEMA BCA software and guidance documents
3. Identify what is categorized as a benefit
4. Learn how to appropriately document damages
5. Review best practices for BCAs

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

What is a Benefit Cost Analysis (BCA) ?

- **Benefit-Cost Analysis (BCA**) is a method that quantifies the benefits of a mitigation project compared to its costs.
  - Goal: break the cycle of damage, reconstruction, and repeated damage



SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

How do we use the BCA?

We practice the concept of BCA everyday – it just may look a little different.

- Think about how you evaluate decisions

What factors go into your decision?

- Cost
- Risk
- Convenience
- Timing

SNC·LAVALIN

ATKINS
Member of the SNC-Lavalin Group

What is the purpose of a BCA?

Shows if project is cost-effective

If an action's benefits are greater than its costs, then it is considered **cost-effective**.

Once benefits for an action are added up, that value is divided by the costs, which produces the **Benefit-Cost Ratio (BCR)**.

$$\frac{\textbf{Benefits}}{\textbf{Costs}} = \textbf{BCR}$$

If the BCR is greater than or equal to 1.0, then the action is cost-effective.

Are BCAs required?

YES!

Should be the FIRST action completed to validate project's eligibility

- Required component for HMA projects
- Required for some 406 (Public Assistance) mitigation projects

Bonus:

- Helps communities make informed decisions about their risks and **prioritize projects**

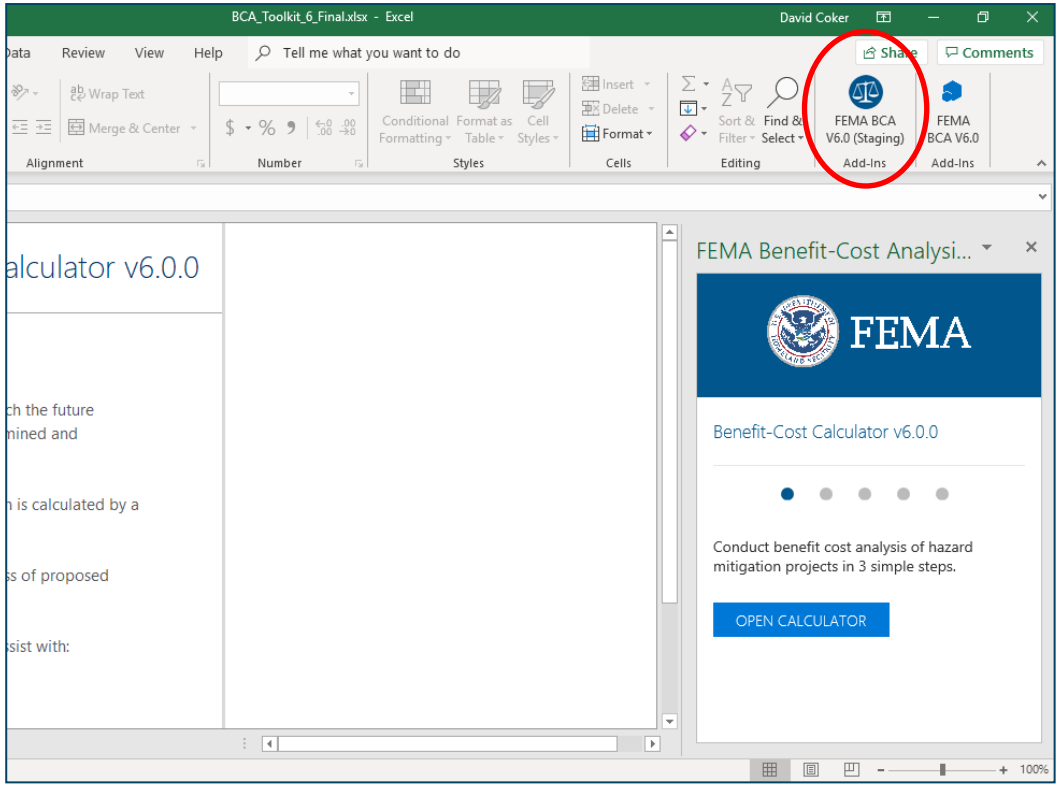
Why are BCAs required ?

- Demonstrate that a project is cost effective
- FEMA National Benefit Ratio:
  - For every $1 spent, $6 should be saved
- BCAs can help you set priorities among projects
- BCAs help you determine if a project is a good investment
- BCAs help “sell” good mitigation projects to the communities involved

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

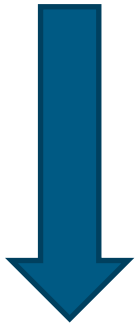
Overview of Software: Where to Download

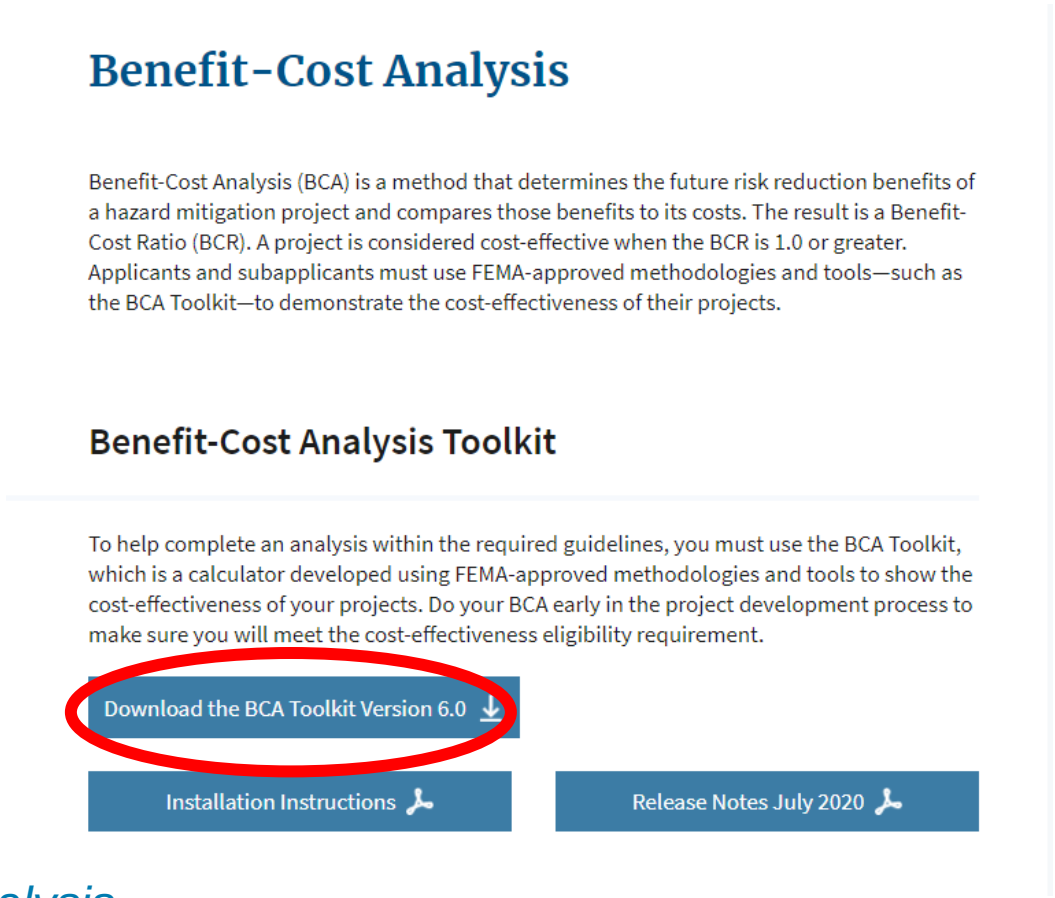
- FEMA has developed the BCA Toolkit.
- The BCA Toolkit is an Excel-based tool



Overview of Software: How to Access

- Review Installation Instructions
- Download BCA Toolkit Version 6.0
- Open on desktop/laptop





https://www.fema.gov/grants/guidance-tools/benefit-cost-analysis

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

Overview of Software: Reference Documents

Get Support Conducting a Benefit-Cost Analysis

Reference Guide

The BCA Reference Guide is the primary guide to conducting a Benefit-Cost Analysis. It gives an overview of:

- Benefits and costs
- How to use the software to get a Benefit-Cost Ratio for a single project or multiple projects
- Information about pre-calculated benefits

View the BCA Reference Guide

Supplement to the BCA Reference Guide

Training

FEMA provides both classroom and online independent study courses for FEMA, state, local, territorial, and tribal staff to learn BCA fundamentals.

To see upcoming offerings and register for the classroom BCA course (E0276), visit the FEMA training website and search the course catalog for "Benefit-Cost Analysis." You can also download the training materials used in the classroom course.

SNC·LAVALIN

ATKINS
Member of the SNC-Lavalin Group

Overview of Software: Advice

It is **extremely** important to keep in mind that the BCA Toolkit is a calculator, **not** a data validation or analysis tool.

Garbage in = garbage out

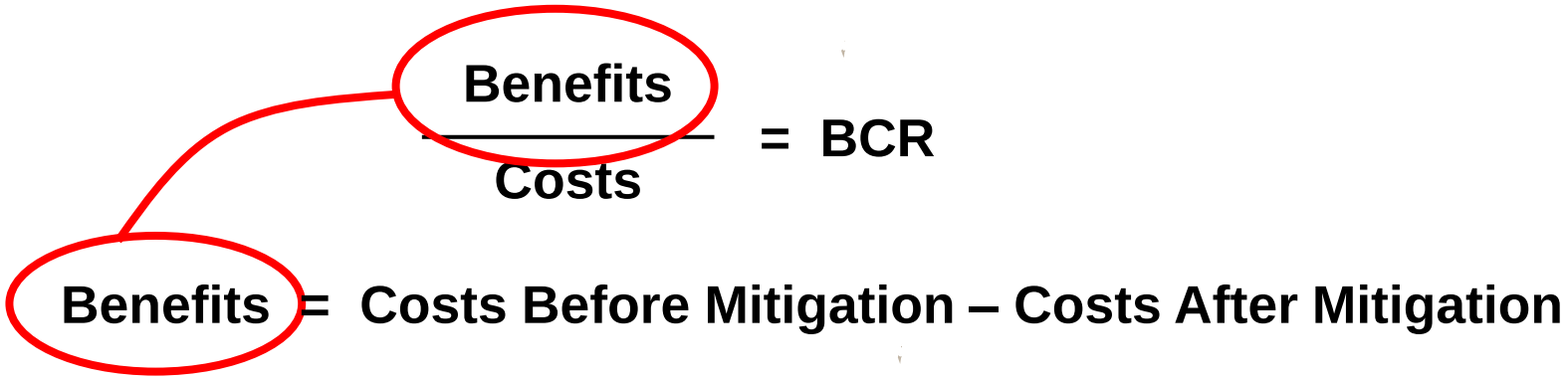
Properly sourced and documented data sources are **always** required as part of your project application!

Document, Document, Document

What is a benefit?

Benefits are any future costs or losses that can be avoided by completing a mitigation project

› The difference in the costs before mitigation and costs after mitigation



› *Future costs should be included: no matter who is responsible for the cost*

What is a benefit?

Avoided Physical Damages

Avoided Loss of Function Costs

Avoided Casualties

Avoided Emergency Management Costs

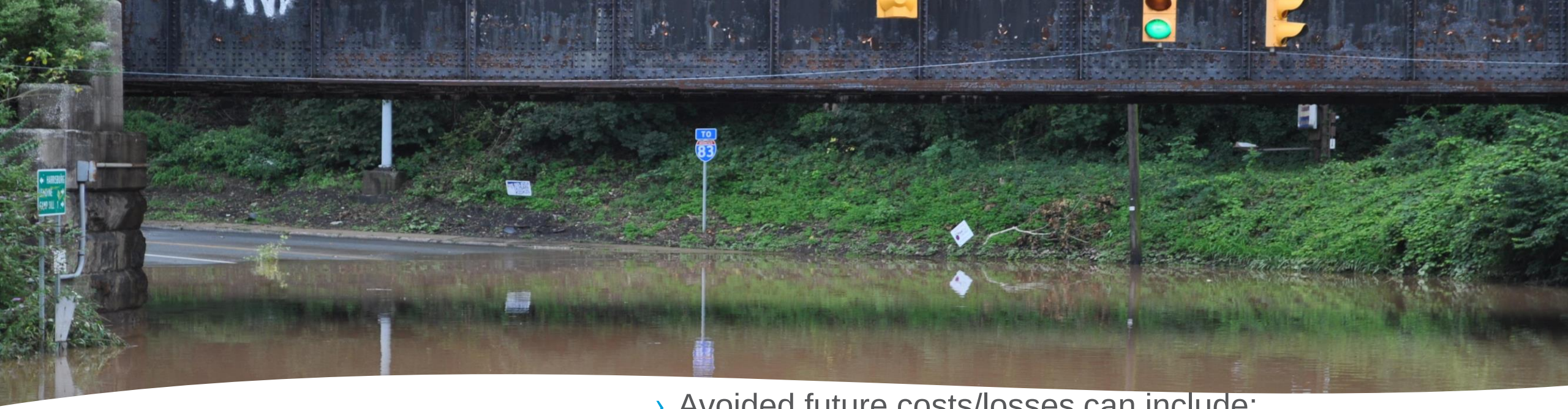
MEMA BCA Resource Page

www.mass.gov/service-details/benefit-cost-analysis-bca

What Is a Benefit?

The benefit of a mitigation project is simply the difference in expected damage and loss before and after the project is completed. Benefits of a proposed mitigation project can be sorted into four main categories:

Avoided Physical Damage	Buildings Contents Infrastructure Landscaping Site Contamination Vehicles Equipment
Avoided Loss-of-Function Costs	Displacement costs for temporary quarters Loss of rental income Loss of business income Lost wages Disruption time for residents Loss of public services Economic impact of loss of utility services Economic impact of road/bridge closures
Avoided Casualties	Deaths Injuries Illnesses
Avoided Emergency Management Costs	Emergency operations center costs Evacuation or rescue costs Security costs Temporary protective measure costs Debris removal and cleanup costs Other management costs



How to Identify Benefits?

- Avoided future costs/losses can include:
  - *Physical damage*
  - *Loss of service/function*
  - *Injury or death*
  - *Displacement costs*
  - *Emergency management costs*
- What benefit might be the result of a mitigation measure in this area?

Benefits: Physical Damages

- Benefit: avoided physical damages
  - *Example: if mitigation project is an acquisition where the structure is being demolished, there is no longer any risk at that location*
- Physical damages can include:
  - Structural damage to buildings or infrastructure
  - Contents damage
  - Damage to historic/cultural resources
  - Site contamination

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

Avoided Loss of Service/Function: Type

- Within BCA software default values and categories are available
- Loss of:
  - Electricity
  - Potable Water
  - Wastewater
  - Roads and Bridges
  - Critical Facility Properties

Avoided Loss of Service/Function: Values

Loss of Service Type	FEMA Standard Value
Electrical power	$174/person/day
Potable water	$114/person/day
Wastewater	$58/person/day

Additional Benefits

- Avoided Displacement Costs
- Avoided Emergency Management Costs
- Avoided NFIP Administration Costs

Other Benefits

- In addition to avoided costs, hazard mitigation projects can have other benefits.
  - *Social benefits*
  - *Environmental benefits*

Social Benefits

- **Social benefits** capture the avoided costs associated with:
  - Mental stress & anxiety
  - Lost wages
- Only projects that protect residential structures

Social Benefit	FEMA Standard Value
Mental stress & anxiety	$2,443/person
Lost productivity	$8,736/person

SNC·LAVALIN ATKINS Member of the SNC-Lavalin Group

Environmental Benefits

Environmental benefits are benefits resulting from an improved natural environment.

- Applicable projects include:
  - *Acquisitions, Relocations, and Floodplain, Stream, or Coastal Restoration*
- Default values are in **software**

Type of space	FEMA Standard Value
Green Open Space	$8,308/acre/year
Riparian	$39,545/acre/year
Wetlands	$6,010/acre/year
Forest	$554/acre/year
Marine & Estuary	$1,799/acre/year

Pre-Calculated Benefits

- What are pre-calculated benefits?
  - FEMA **pre-calculated benefits** that provide pre-determined cost effectiveness values.
- Pre-calculated benefits eliminate requirements to conduct a separate BCA for eligible projects:
  - Acquisitions and Elevations in the Special Flood Hazard Area (SFHA)
  - Residential Hurricane Wind Retrofits
  - Non-Residential Hurricane Wind Retrofits
  - Residential Tornado Safe Rooms
  - Post-Wildfire Mitigation
- **Projects must still meet all other HMA application requirements**
- *Visit software for details and amounts*

FEMA's BCA website

What is a Damage?

- An application must contain actual or projected damage
  - *Clearly explain the purpose and need for the project*
- Damage data should include:
  - *Damage figures and dates*
  - *Details about the storm event*

How to Document Damages?

Sources of information for damage include:

- Insurance claims/records
- FEMA mapping data
  - Frequencies or Reoccurrence Intervals (RIs) linked to documented Flood Insurance Study (FIS) data
  - State NFIP representatives: repetitive loss, documented damages
- U.S. Army Corps of Engineers (USACE)
- U.S. Geological Survey stream gauge data or National Oceanic and Atmospheric Administration (NOAA) tide gauge data
- Water management agencies
- Newspaper accounts citing credible sources, such as a public agency
- Copies of engineering/technical expert reports
- StreamStats (USGS)

Understanding the FEMA Benefit Cost Process

What to do with Expected Damages

If historical damage are unknown or undocumented, use Expected Damages

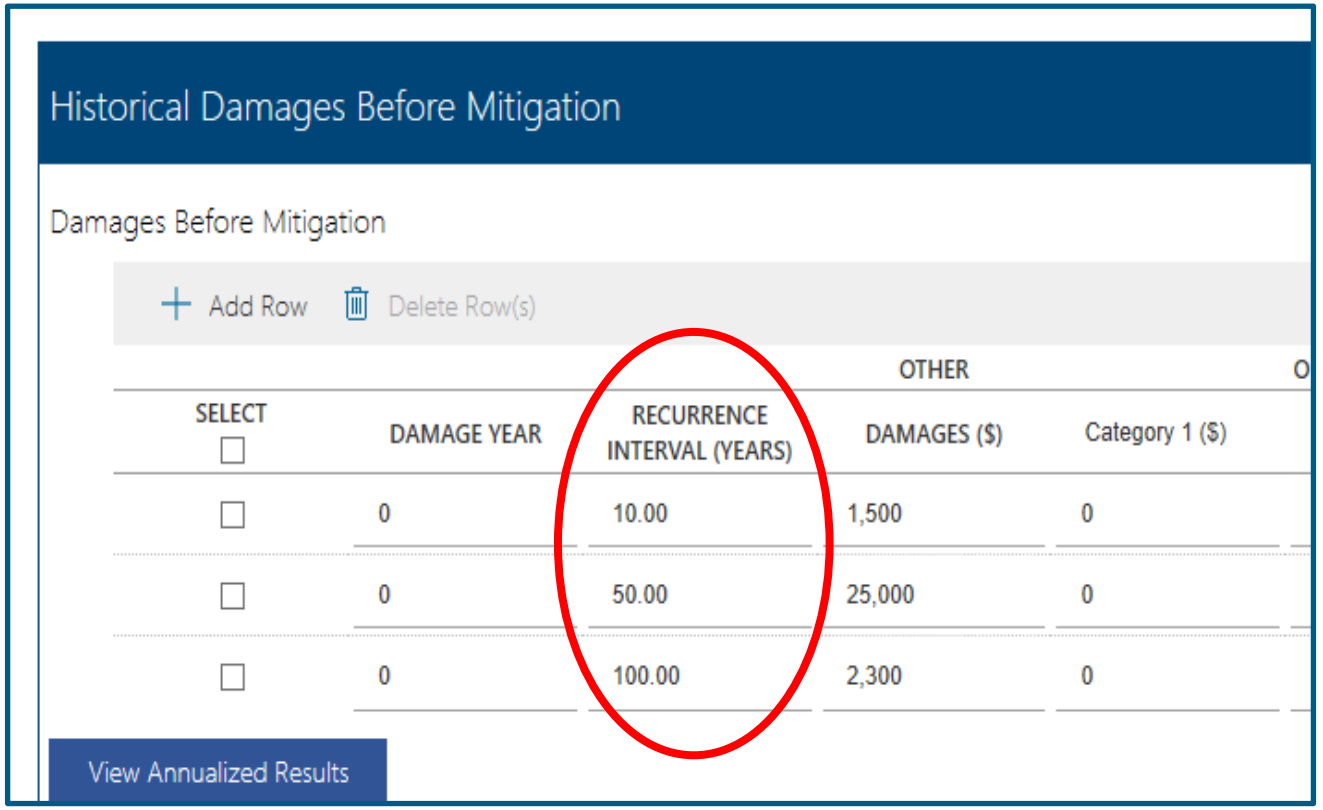
- Professional Expected Damages:
  - Based on damage estimates from a licensed and qualified professional with known recurrence intervals (RI)
  - Identified RI(s) and estimated damages for each event.
  - Must identify and document data

- Examples:
  - *Hydrology and hydraulics (H&H) studies that indicate expected flood damages*
  - *Technical studies containing project area*
  - *Qualified engineer report and/or analysis*
  - *Hazus with project specific depth grids*

Recurrence Interval (RI)

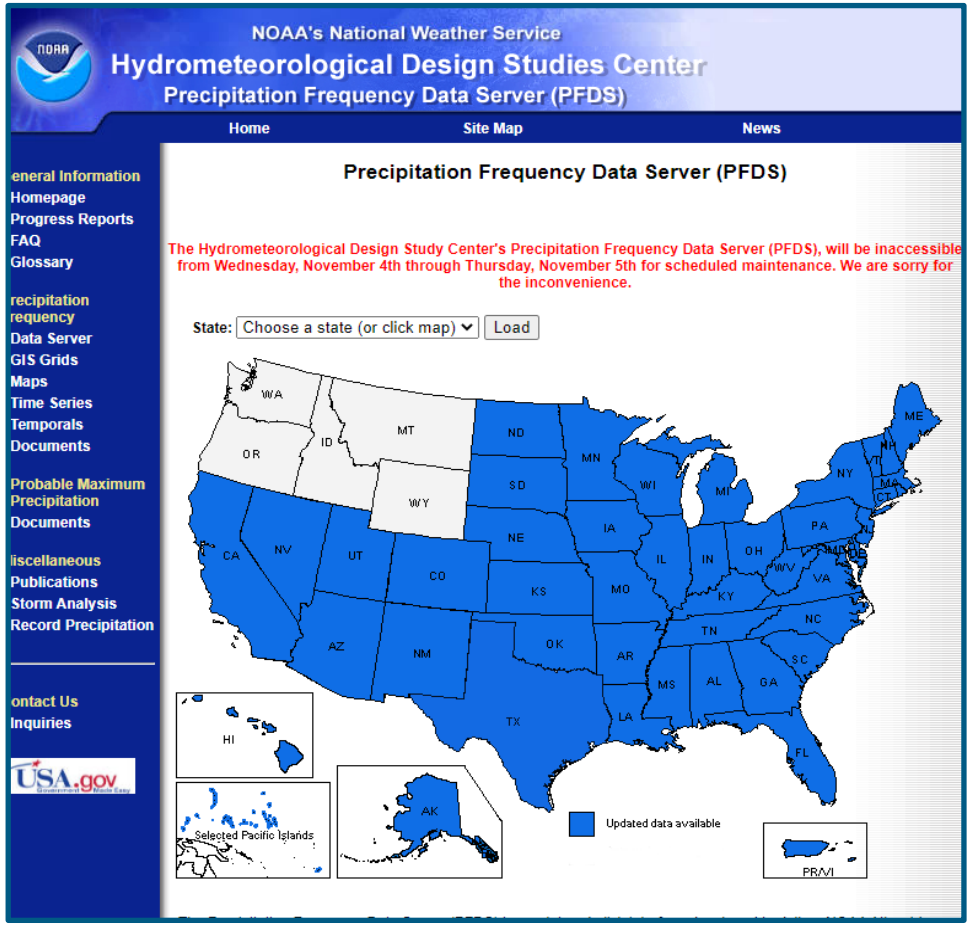
A **recurrence interval (RI)** is how often a hazard event of specific severity is likely to occur in a particular location.

- An RI is often talked about as the “X-year” or “Y% annual chance” event
  - For example, the “100-year flood” is the 1% annual chance flood, meaning that in any given year, there is a 1% chance it will occur.



Recurrence Interval (RI): Resource

- FEMA Flood Map Service Center | Welcome!
- Flood Map Changes Viewer (arcgis.com)
- StreamStats (usgs.gov)
- Water Resources of the United States—National Water Information System (NWIS) Mapper (usgs.gov)
- NOAA - National Weather Service - Water
- AHPS Precipitation Analysis (weather.gov)
- National Weather Service Advanced Hydrologic Prediction Service
- Office of Water Prediction (noaa.gov)
- PF Data Server-PFDS/HDSC/OWP (noaa.gov)
- HDSC Current PF Documents (weather.gov)
- Boston / Norton, MA (weather.gov)
- NASA SEDAC Hazards Mapper (columbia.edu)



Project Effectiveness

Project effectiveness measures how well the project will reduce future damages

- Is the level of protection being increased?
  - *Yes > move forward with project BCA*
  - *No > back to drawing board*
- After Mitigation Damages:
  - *Only structure acquisition/demolition projects are 100% effective – i.e., they have $0 costs after mitigation*
  - *ALL other project types assume some (but reduced) hazard risk upon project completion—this is called **residual risk***

Documentation Best Practices

DOCUMENT ALL DATA, NUMBERS, INFORMATION, ANYTHING SUBMITTED IN AND WITH THE BCA

ORGANIZE LIKE TELLING A STORY OF THE DAMAGE: WHAT, WHERE, WHY, HOW

PICTURES! PICTURES OF DAMAGE AND/OR DAMAGE EVENT DOCUMENTS OCCURRENCE AND SEVERITY (IN SOME CASES)

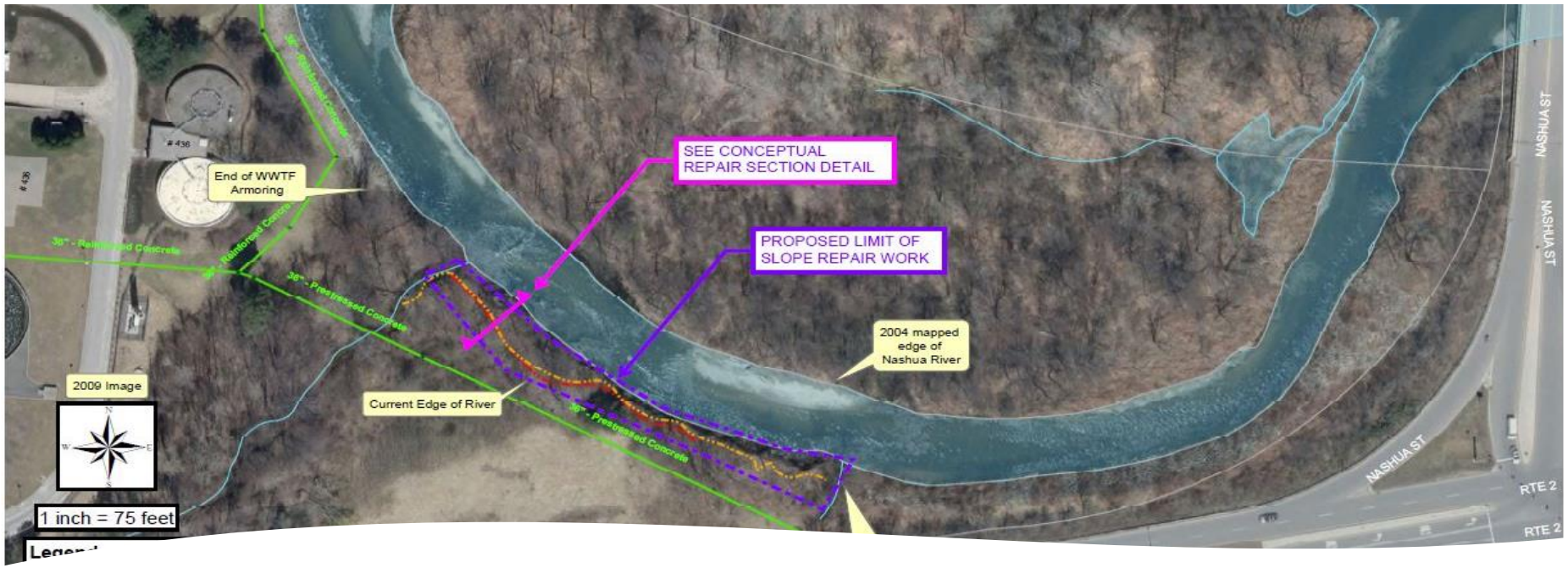
Example: Chelmsford – Bank Stabilization

- Merrimack River Bank Stabilization project that focused on the protection of a critical sewer line.
- Project was funded through the HMGP program.
- Completed Summer 2019

SNC·LAVALIN

ATKINS
Member of the SNC-Lavalin Group

Example: Leominster - Bank Stabilization



Nashua River Bank Stabilization project focuses on the protection of a critical sewer line and wastewater treatment facility.

Project is underway and being funded through the HMGP program.

Project is scheduled to be completed in Fall 2022.

References

Helpful Online References:

- FEMA Benefit Cost Analysis Toolkit
- Understanding the FEMA Benefit-Cost Analysis Process
- FEMA BCA Reference Guide
- FEMA Supplement to the Benefit-Cost Analysis Reference Guide
- BCA Software Guidance
- Mass Gov MEMA BCA Page

Contact Us:

Shelly O'Toole

MEMA Region 1 & 3

Michelle.OToole@mass.gov

(508) 820-1443

David Woodbury

MEMA Region 2 & 4

David.Woodbury@mass.gov

(508) 820-2034

MEMA Hazard Mitigation Website