

# Emergency Action Plans

## EAPs

Focus on Apache Brazito Mesquite Site #1

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# Very brief Dam Safety History

- 1972: Buffalo Creek Dam failure
- 1976: Teton Dam failure
- 1978: USACOE begins national inspection program
- 1986, 1996, 2002: Water Resources Development Acts included funding for state dam safety programs
- 2006: National Dam Safety Act of 2006 (P.L. 109-460)
  - Defined many terms we use today
  - Talked about Emergency Action planning
  - Established the authority of the state

# Why prepare EAPs?

- 19.25.12.18 New Mexico Administrative Code
  - “Owners of dams classified as **high or significant hazard** potential **shall prepare**, maintain and exercise an **emergency action plan** for immediate action in the event of a potential dam failure.”

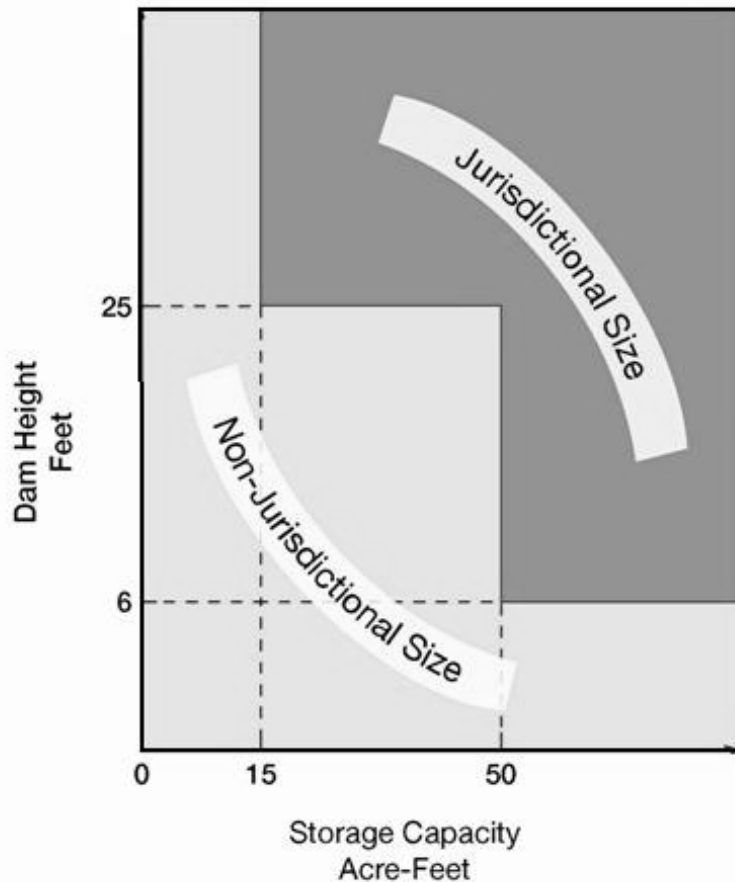
# When is an EAP required?

- Dams that are under the jurisdiction of the State Engineer (Jurisdictional Dams)

and

- Dams that are High or Significant Hazard

# Jurisdictional Size



Determined by:  
Height  
Storage

Office of the State Engineer  
19.25.12.7

# Hazard Classification

- Low
  - Probably no loss of life
  - Low economic loss
- Significant
  - Probably no loss of life
  - Significant economic loss
- High
  - Probably will cause loss of life

# Specified content of EAPs

- Certifications
- Basic data for dam
- The emergency level evaluation process
- Notification flowchart
- Roles and Responsibilities
- Inundation map
- Evacuation map

OSE has a template

# Inundation Map Process

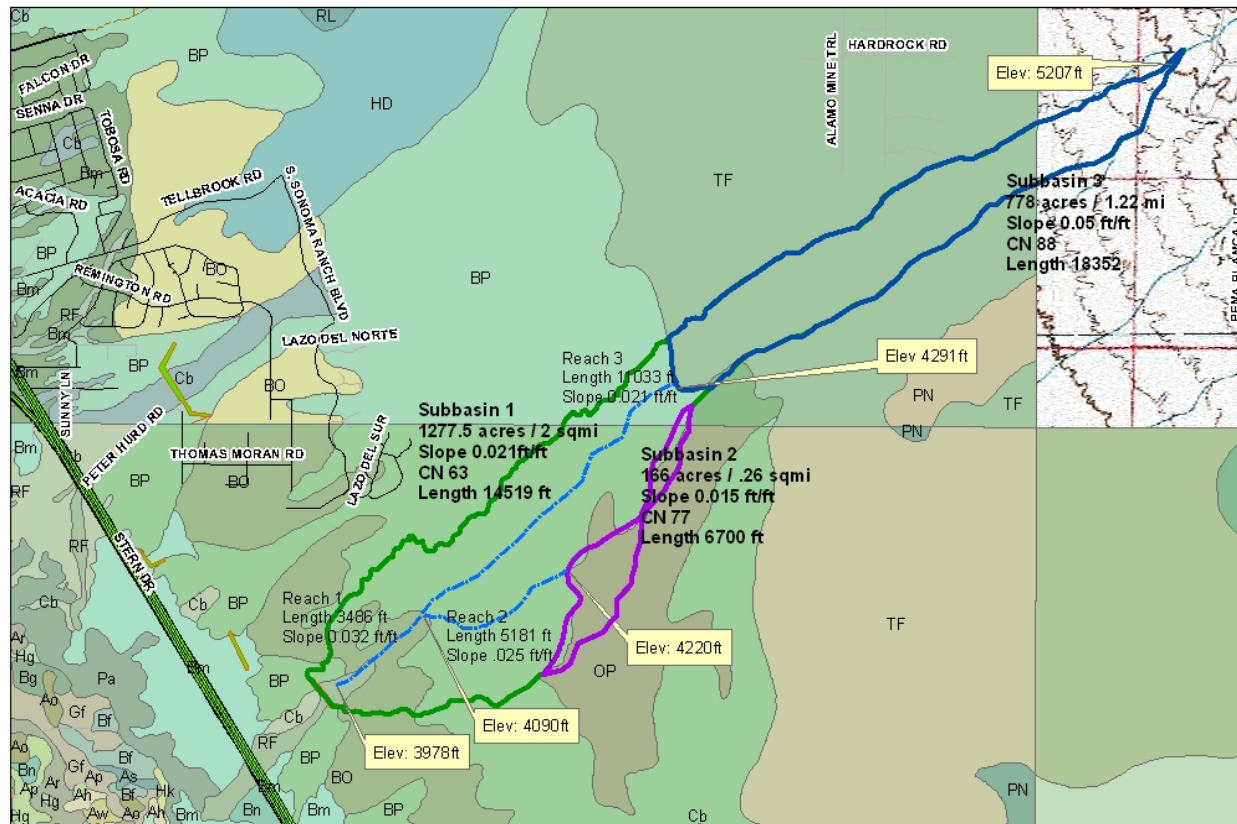
1. Watershed characteristics
2. Storm event hyetograph
3. Inflow hydrograph
4. Dam characteristics
5. Breach analysis
6. Outflow hydrograph
7. Flood routing analysis
8. Inundation map



# Watershed Characteristics

- Soil types (USDA Web Site Survey works well)
- Watershed broken into sub-basins
  - Tributaries
  - Soil types
- Each sub-basins
  - Area
  - Slope
  - Length
  - Curve numbers

# Watershed input



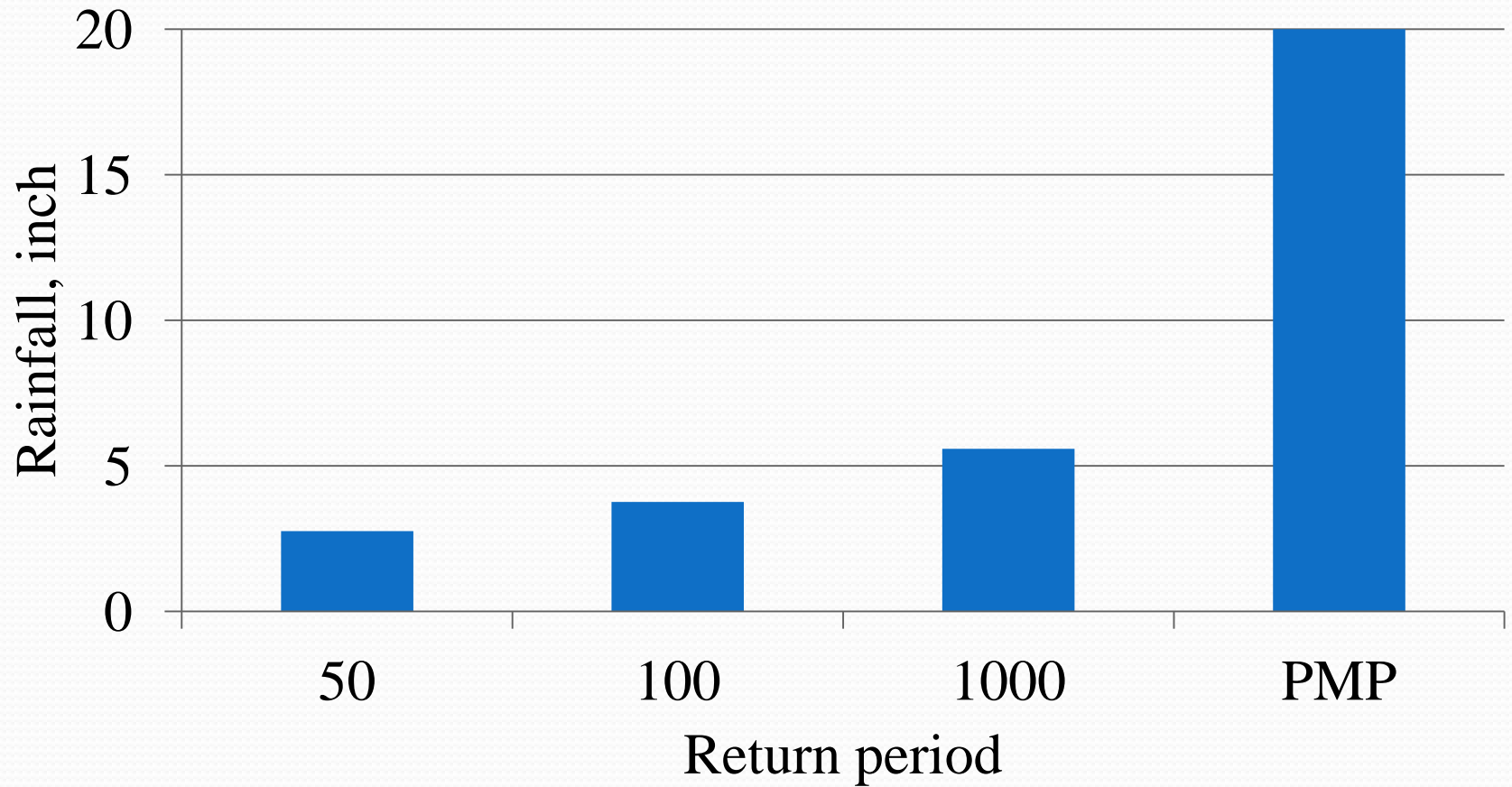
Apache Brazito Mesquite #1 Watershed

# Storm Event

## Apache Brazito Mesquite #1

- Designed in 1964
- Pool the 50-year, 6-hr storm event (2.76 inch)  
NOAA Atlas 14: 50-yr, 6-hr event = 2.66 inch
- Emergency spillway sized for 5.52 inch rainfall event  
NOAA Atlas 14: 1,000-yr, 24-hr event = 5.59 inch
- OSE Dam Safety has been insisting on PMP event  
NOAA's HMR-55: 24-hr PMP = 20 inch!!!

# Storm events



# Impact of PMP

- By definition the probability of a PMP event is zero
- We are really developing an inundation map for the PMP event, not the dam breach event!

# Inflow Hydrograph

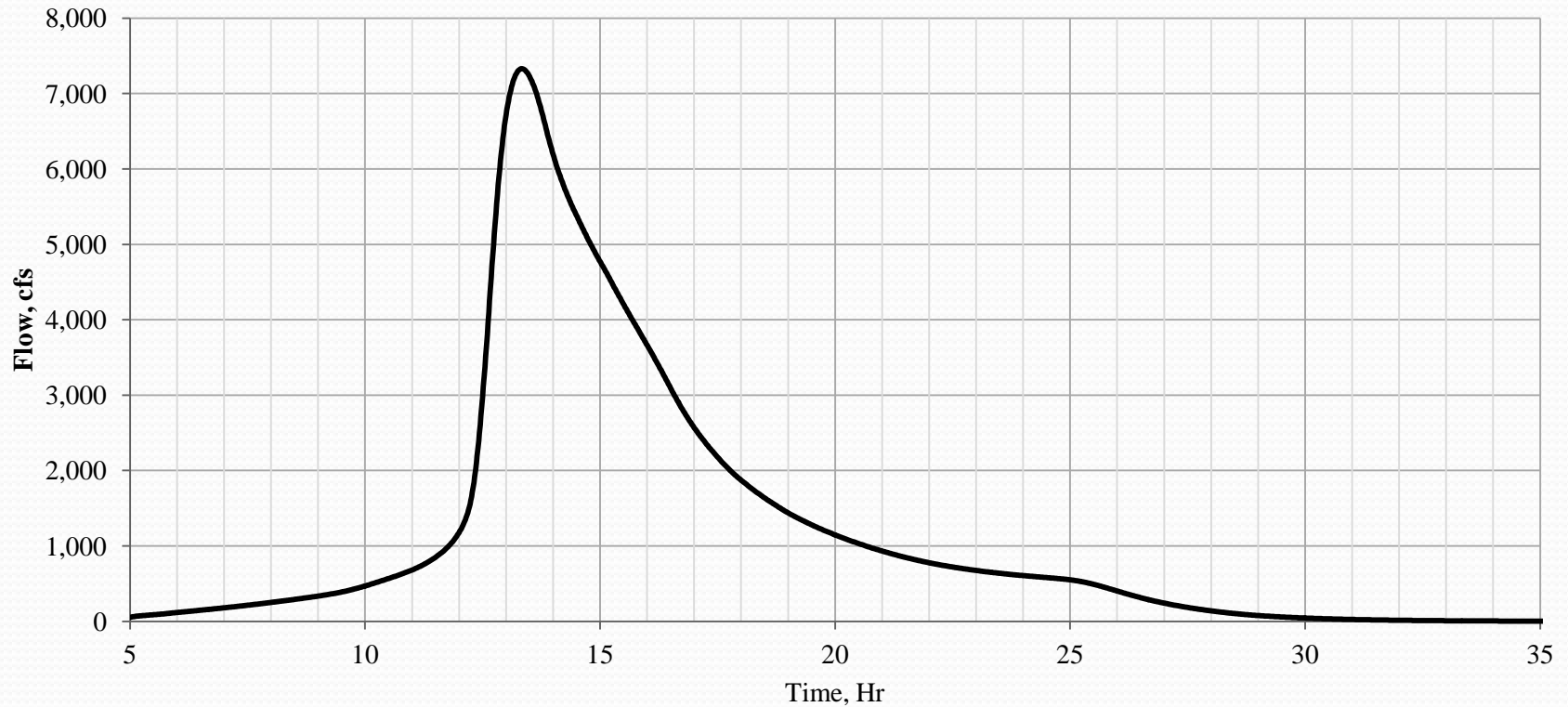
- HEC-HMS input:

USACOE Hydrologic Engineering Center - Hydrologic Modeling System

- Hyetograph
  - SCS type II storm
- Watershed size and terrain
- Sub-basins
- Output: the inflow hydrograph

# Inflow Hydrograph

**Inflow Hydrograph**  
**20 in, 24 hr**



# Dam Characteristics

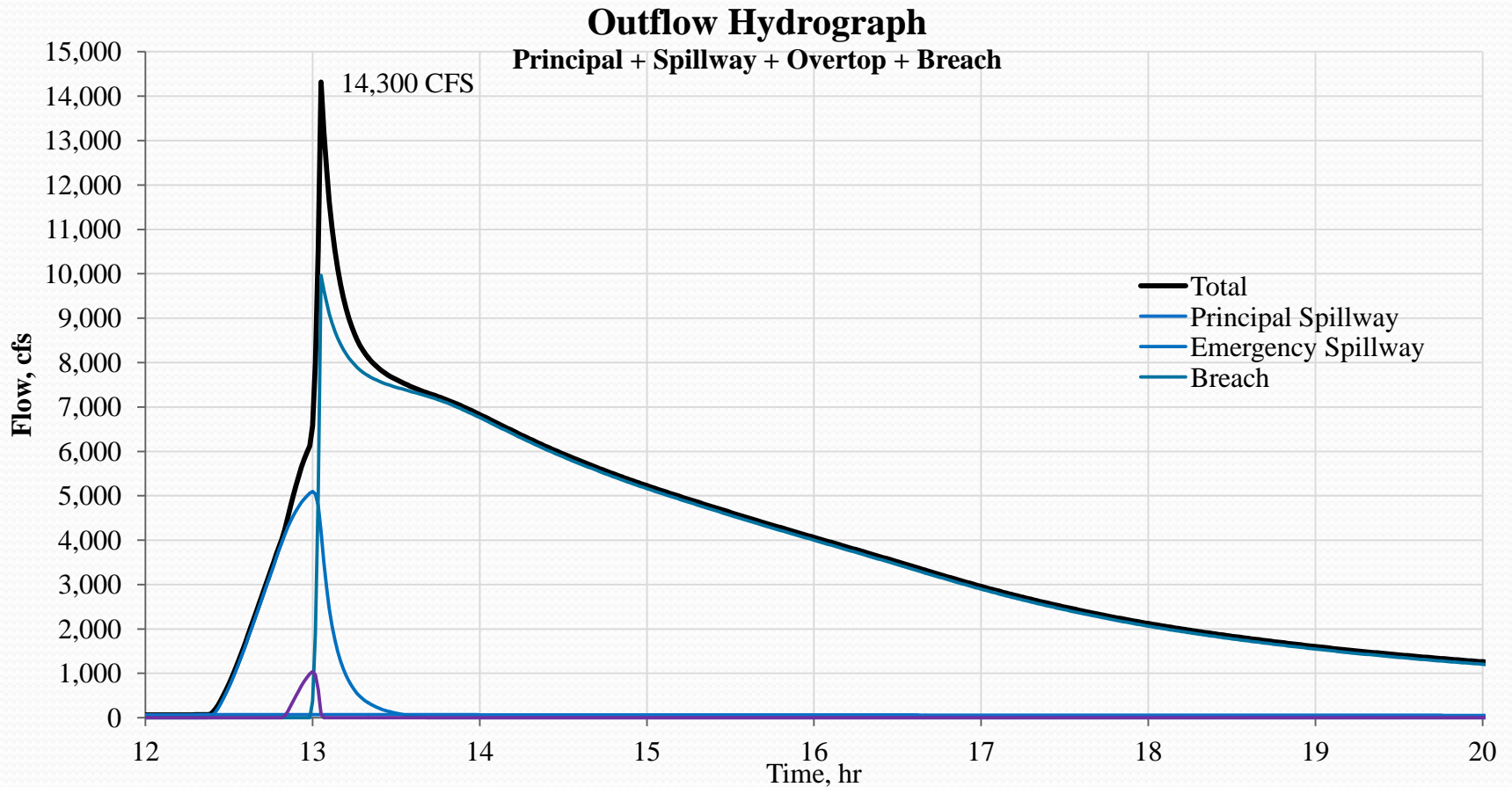
- Dam storage rating curves
- Elevations
  - Embankment
  - Principal spillway(s)
  - Emergency spillway(s)
- Discharge capacities
  - Principal spillway(s)
  - Emergency spillway(s)



# Breach Analysis

- Failure by piping
  - Flood control dams are dry, piping probably does not have time to develop
- Failure by over-topping
  - Forces a storm event that would exceed the emergency spillway
- “Mystery” breach at a predetermined condition
  - Is the emergency spillway flowing or not?
- Development time and ultimate size poorly developed

# Outflow hydrograph



# Flood Routing

- HEC-RAS should simplify this task

USACOE Hydrologic Engineering Center – River Analysis System

- I-10 crosses the watercourse
  - The high point on I-10 is in the center of the outflow channel
  - Flow is split into several directions
- HEC-RAS is a linear program and does not handle diverging flows

# Inundation Map

- Proper flood routing will result in a time-phased inundation map
- The inundation map is the end product of the technical phase of the work

# Evacuation Map

- The inundation map forms the basis for the evacuation map
- Ideally, the Local Emergency Management group will take the lead developing the evacuation map with the sponsor's support



Questions / discussions