Lesson Learned

Emergency Action Plans can save lives and must be updated, understood, and practiced regularly to be effective.

DRAFT DOCUMENT

In October 2013, the Federal Emergency Management Agency's National Dam Safety Program sponsored the research and development of a compendium of dam incidents and failures with emphasis on the lessons learned from these events. This information is presented through FEMA's Lessons Learned Information Sharing website. For a complete listing of available lessons learned and case study summaries or to contribute your own content, please visit:

Dam Incidents and Failures Website

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Emergency Action Plans can save lives and must be updated, understood, and practiced regularly to be effective.

"An *Emergency Action Plan (EAP)* is one of the primary safeguards against the loss of life and property damage that can result from the *failure* of a high hazard potential dam. Today, there are approximately 8,300 state-regulated high *hazard potential* dams in the United States. Of these 8,300 dams, approximately 40 percent do not have an EAP." (1)

The National Dam Safety Program encourages the implementation of effective EAPs for high and significant hazard dams in the United States. Though program has certainly enhanced the *safety* and regulation of dams, considerable opportunities for improvement remain. Increasing the number of dams with an EAP and encouraging dam owners, dam operators, and emergency personnel to regularly update and practice their EAP are important goals of the program.

"An EAP is a formal document that identifies potential *emergency* conditions at a [high or significant hazard] dam and specifies actions to be followed to minimize loss of life and property damage. The EAP includes:

- Actions the dam owner will take to moderate or alleviate a problem at the dam
- Actions the dam owner will take in coordination with *emergency management authorities* to respond to incidents or emergencies related to the dam
- Procedures dam owners will follow to issue early warning and *notification* messages to responsible downstream emergency management authorities
- *Inundation maps* to help dam owners and emergency management authorities identify critical infrastructure and population-at-risk sites that may require protective measures, warning, and evacuation planning
- Delineation of the responsibilities of all those involved in managing an incident or emergency and how the responsibilities should be coordinated" (3)

Dam operators and first responders perform an EAP simulation exercise to rehearse emergency procedures.

Although EAPs are drafted with the intention of minimizing downstream *consequences*, the document itself cannot save lives and protect property downstream. Simply possessing an EAP does not ensure that communities downstream will be protected in the event of dam failure. In order to increase the chance of averting disastrous consequences during dam failure, EAPs must be understood and routinely practiced by all those involved. First, copies of the EAP should be distributed by the dam owner to anyone involved in its implementation. In order to present, simulate, and practice the information contained within the EAP document, orientation and *emergency simulation exercises* should be executed in the presence of dam operations and first responders.

Thorough reviews of a dam's EAP should be conducted at least once a year to determine if it will remain effective or if modifications are necessary. Updates to an EAP may include the results of changes in contact information, flood inundation maps, downstream development (hazard creep), or emergency procedures. In the event that a portion of the EAP is altered, copies should be redistributed and routine practice resumed adhering to the newly revised plan.

Continue Reading ▶

Effective Emergency Action Plans are those that are updated, understood, and practiced by all persons involved. These EAPs harbor the potential to save lives and preserve property downstream of a dam in the event of failure.

(1) FEMA. (2007). *Emergency Action Planning for State Regulated High-Hazard Potential Dams: Findings, Recommendations, and Strategies*. Federal Emergency Management Agency.

(2) ASDSO. *What is the National Dam Safety & Security Program and Why Should it Continue?* Lexington: Association of State Dam Safety Officials.

(3) FEMA. (2013). *Federal Guidelines for Dam Safety: Emergency Action Planning for Dams*. Federal Emergency Management Agency.

(4) FEMA. (2006). *National Flood Insurance Program Community Rating System: CRS Credit for Dam Safety*. Federal Emergency Management Agency.

(5) FEMA. (2004). *The National Safety Program: 25 Years of Excellence*. Federal Emergency Management Agency.

Name: Baldwin Hills Dam
Location: California, USA
Type of Dam: Earthfill
Dam Height: 232 ft.
Date of Incident: Dec. 14, 1963
Fatalities: 5
Property Damage: $11 Million

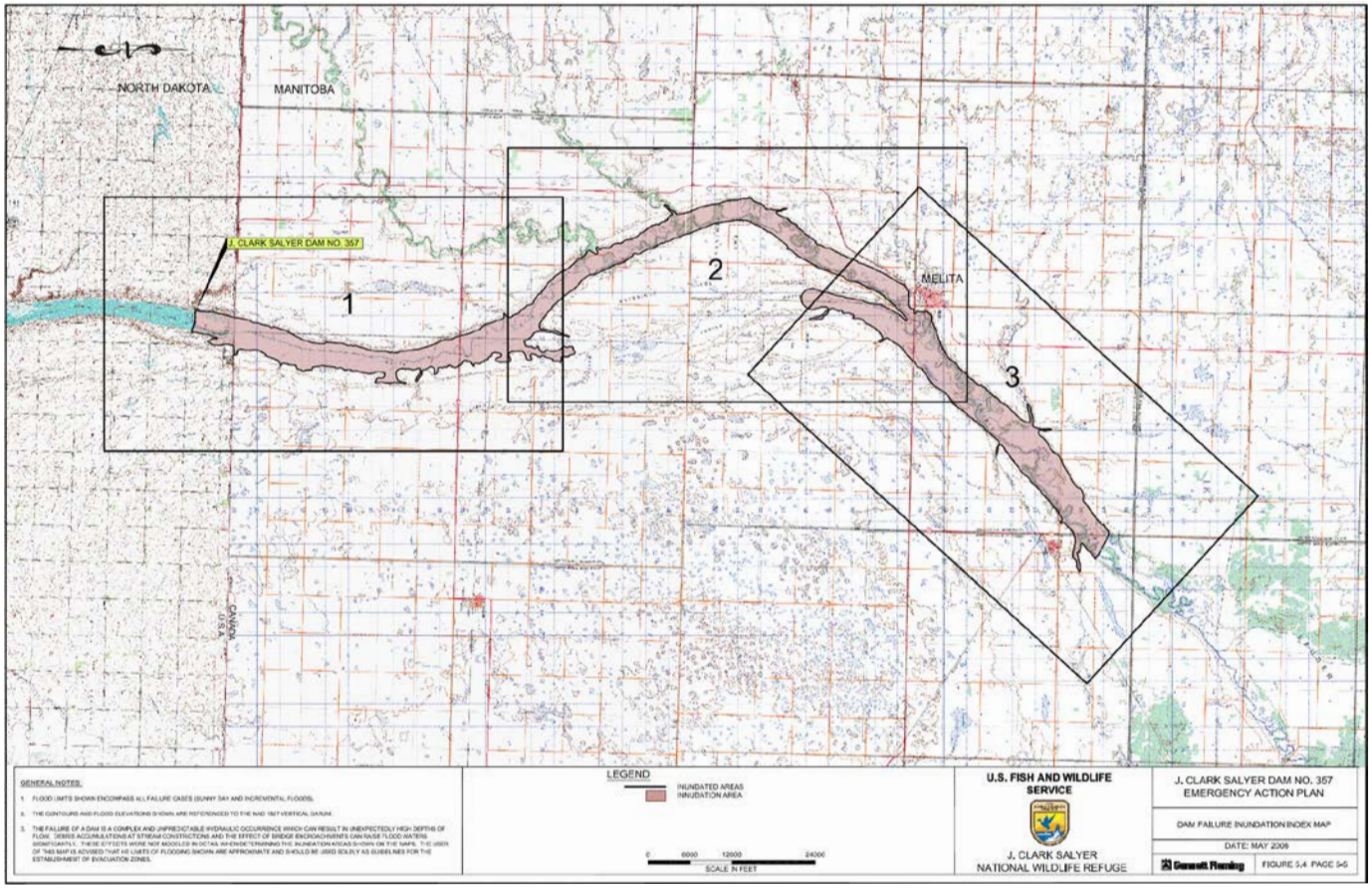
Additional Relevant Case Studies

1. Meadow Pond Dam (New Hampshire, 1996)
2. Big Bay Lake Dam (Mississippi, 2004)
3. Lake Needwood Dam (Maryland, 2006)
4. Lawn Lake Dam (Colorado, 1982)
5. Percy Quin Dam/Lake Tangipahoa Dam (Mississippi, 2012)
6. Vajont Dam (Italy, 1963)
7. Austin Dam/Bayless Dam (Pennsylvania, 1911)
8. Laurel Run Dam (Pennsylvania, 1977)

Emergency Action Plan development meeting. Attendees include dam safety officials, dam operators, and first responders.

Tabletop Emergency Action Plan exercise during which emergency situations and appropriate responses are discussed.

Functional Emergency Action Plan exercise. During a functional exercise, individual and group performance in response to a proposed emergency situation is evaluated and critiqued.



Maps containing projected flood areas resulting from a dam failure can provide a basis for decision making during EAP development and implementation.

Emergency personnel executing evacuation. Though EAPs do not require that an evacuation plan be included, they must contain information on the authority responsible for implementing an evacuation if necessary.

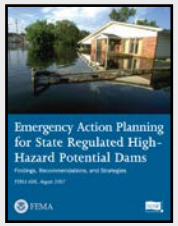
First responders react to flooding emergency.

Video supplement to the Training Aids for Dam Safety publication on the proper procedures for developing and implementing an EAP.

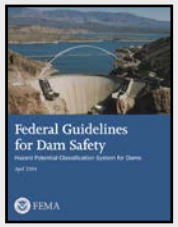
Video supplement to the Training Aids for Dam Safety publication on the responsibilities of dam owners and guidelines to ensure dam safety.

Overview of importance and development of EAPs for dams created by the Association of State Dam Safety Officials.

Animation describing hazard creep developed by the Association of State Dam Safety Officials. Hazard creep is one of many reasons EAPs must be regularly updated.

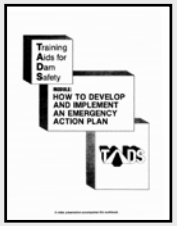


Emergency Action Planning for State Regulated High-Hazard Potential Dams: Findings, Recommendations, and Strategies
Author: Federal Emergency Management Agency
Date of Publication: 2007

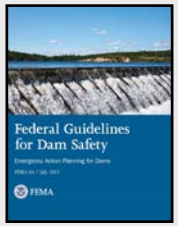


Federal Guidelines for Dam Safety: Hazard Potential Classification System for Dams
Author: Federal Emergency Management Agency
Date of Publication: 2004

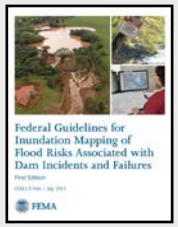
Training Aids for Dam Safety: Dam Safety Awareness
Author: U.S. Bureau of Reclamation
Date of Publication: Unknown



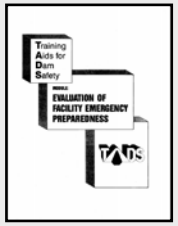
Training Aids for Dam Safety: How to Develop and Implement and Emergency Action Plan
Author: U.S. Bureau of Reclamation
Date of Publication: 1989



Federal Guidelines for Dam Safety: Emergency Action Planning for Dams
Author: Federal Emergency Management Agency
Date of Publication: 2013



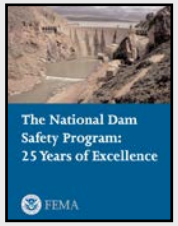
Federal Guidelines for Inundation Mapping of Flood Risks Associated with Dam Incidents and Failures, First Edition
Author: Federal Emergency Management Agency
Date of Publication: 2013



Training Aids for Dam Safety: Evaluation of Facility Emergency Preparedness
Author: U.S. Bureau of Reclamation
Date of Publication: 1988

Emergency Action Planning
Video
Author: Federal Emergency Management Agency
Date of Publication: 2013

National Flood Insurance Program Community Rating System: CRS Credit for Dam Safety
Author: Federal Emergency Management Agency
Date of Publication: 2006



The National Dam Safety Program: 25 Years of Excellence
Author: Federal Energy Regulatory Commission
Date of Publication: 2007

Engineering Guidelines for the Evaluation of Hydropower Projects: Chapter 6, Emergency Action Plans
Author: Federal Energy Regulatory Commission
Date of Publication: 2007

Flood Emergency Plans: Guidelines for Corps Dams
Author: U.S. Army Corps of Engineers
Date of Publication: 1980

What is the National Dam Safety & Security Program and Why Should it Continue?
Author: Association of State Dam Safety Officials
Date of Publication: Unknown

Emergency Action Plan Basics
Webinar published by Association of State Dam Safety Officials
Author: J. W. France
Date of Publication: 2012

Emergency Action Planning for Owners
EAP Resource Center: Guidance Documents, Tools, and Templates
Author: Association of State Dam Safety Officials
Date of Publication: 2014