

Emergency Action Plans (EAP's) for Maryland Dams



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Maryland Dam Safety Workshop
May 9, 2012

Objectives during this session:

- Understand that dams can and do fail
- Understand the importance of having an EAP
- Review the Maryland Model EAP
- Know where to obtain the fillable Model EAP & other technical references

Why Should You Have an EAP for Your Hazard Dam?

- MD Regulations (COMAR) requirement
- Will minimize litigation from dam failure by having & activating an EAP
- **It's the Responsible Thing to Do to Protect Your Community!!!!**

Several dams fail in the U.S. each year



Are YOU prepared to act in
an emergency if your dam
fails?

Do you have an EAP for your
dam?

Is it current?

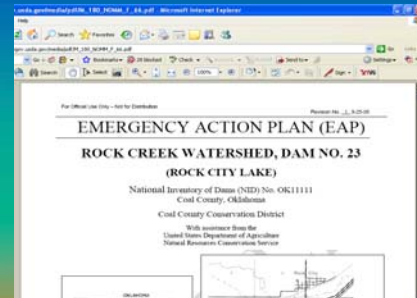
Information Needed to Develop an EAP

- Names & contact information for primary principals involved with the EAP
- Addresses & location of people-at-risk downstream from the dam
- Evacuation map of downstream area
- Dam technical information

Taking the Pain Out of Preparing Emergency Action Plans



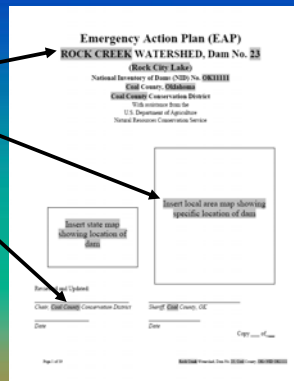
Model EAP (in Microsoft Word)



“Fillable Form” Template

The words, maps, & figures that pertain to a specific site are shaded

Simply click on a shaded box and type in information for your specific dam



Any of the other text can also be edited

Basic EAP Data

Purpose:
The purpose of this EAP is to reduce the risk of human life loss and injury and to minimize property damage during an unusual or emergency event at **Rock Creek Watershed, Dam No. 23**

Potential Impacted Area:
See *Evacuation Map* tab (Appendix B-4) and *People at Risk* tab (Appendix B-5) for the locations and contact information of the following residents and businesses that may be flooded if the dam should fail and the estimated time for the flood wave to travel from the dam to these locations:

- **6 houses:**
 - 4 on the south side of the Elmwood Heights subdivision in southeast Rock City
 - 2 outside city limits
 - 1 on south side of Rock Creek, south of Rock City
 - 1 on east side of Highway 44 approximately 1 mile south of Rock City
- **5 businesses on east side of Highway 44 south of Rock City:**
 - Lori's Music Shop, Larry's Hardware, and Bill's Coffee Shop

EAP Documents Online

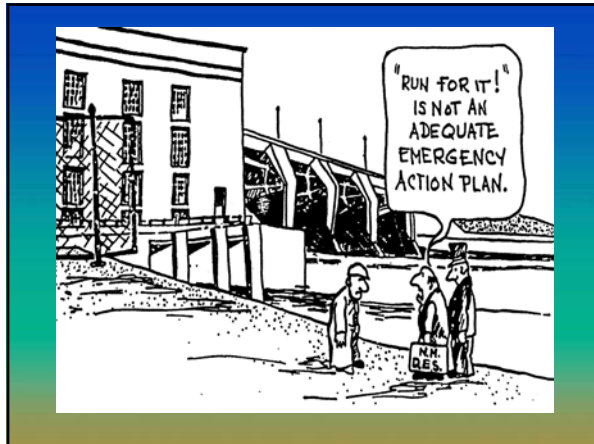
- Search for eaps

- www.mde.state.md.us MDE Site
- www.damsafety.org ASDSO Site
- www.fema.gov FEMA Site
- <https://nid.usace.army.mil> NID Site
-National Inventory of Dams
- www.mema.state.md.us MEMA Site
-search for flood areas
- www.asce.org ASCE Site
-search for dam report card

Public Health & Safety Concerns



Downstream development can put people in harms way



Model Emergency Action Plan

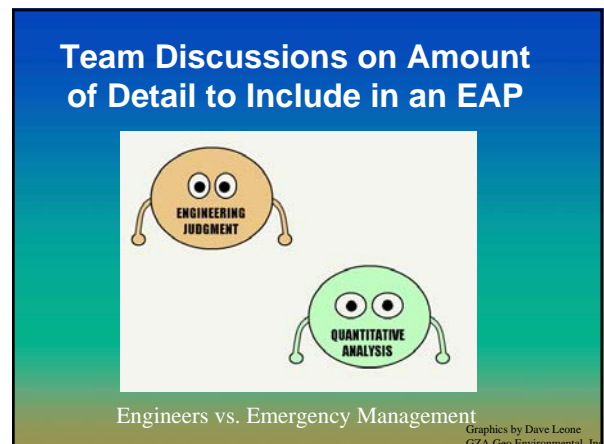
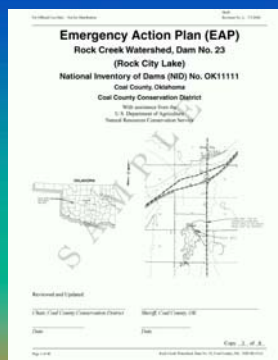
Partnership Effort with
NRCS & ASDSO

Developed in 2004

- Approach Used:**
1. Established multi-agency work group
 2. Gathered good examples of EAPs from:
 - U.S. F&WS
 - NRCS
 - ASDSO Model
 - FEMA 64
 - Federal Guidelines
 - Arizona
 - Montana
 - Pennsylvania
 - Wisconsin
 - Maryland
 3. Compiled best pieces from all examples
 4. Gathered "lessons learned" from activation of EAP's

- ### Multi-Agency Workgroup Members
- Brian Becker – F&WS (now BOR)
 - Larry Caldwell – NRCS
 - Jeff Daniels – Bureau of Reclamation
 - Bruce Harrington – Maryland
 - Maureen Hogle - ASDSO
 - Bill Irwin – NRCS
 - Tom Sanburg – Montana
 - Dan Sebert – National Watershed Coalition
 - Lori Spragens – ASDSO
 - Marilyn Thomas - Kentucky

- ### Approach Used (con't)
5. Developed a Model EAP
 6. Solicited comments from team, NRCS & ASDSO



Purpose of an EAP

Primary: To reduce risk to loss of life

- Determine and communicate the emergency level
- Notify emergency management authorities for possible evacuation of at-risk people
- Identify potential at-risk properties

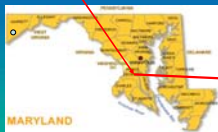
Purpose of an EAP

Secondary: To minimized property damage & prevent dam failure

- Provide technical information and recommend possible mitigating actions during an emergency

Emergency Action Plan For Maryland Dams

Dam Location



Reviewed and Updated:

Dam Owner

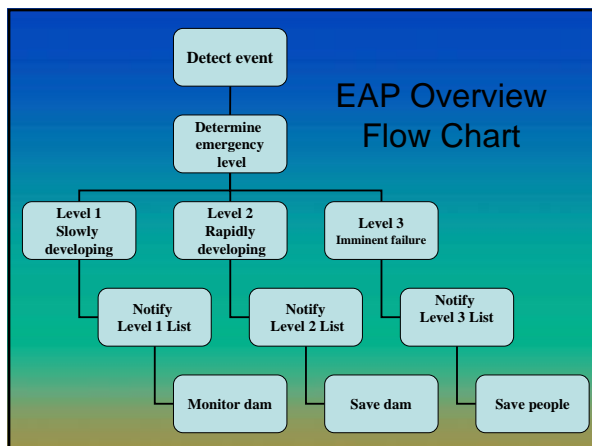
Regional Engineer, MD Dam Safety

Date

Date

Elements of the Model EAP

- EAP Overview Flowchart
- Roles/Responsibilities
- Steps 1 & 2: Detect & Determine Emergency Level
- Step 3: Notification & Communication
- Step 4: Expected Actions
- Step 5: Termination & Follow-up
- Maintenance - EAP Updating & Testing
- Appendices



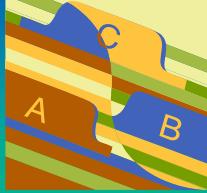
EAP Binder Format

- Place EAP document in a 3-ring binder
- Put 5 “hot tabs” across the top for quick navigation of critical information
- Put side tabs to identify basic EAP topics

Get free tabs up to 15 sets online at:
<http://landcare.nrcs.usda.gov>

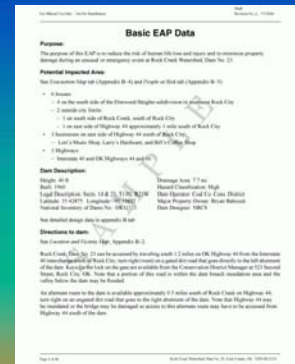
How to use the EAP in an Emergency

- 5 “Hot Button” tabs on top for quick navigation to critical sections
 - Emergency Levels
 - Notification Charts
 - Expected Actions
 - Evacuation Map
 - People At Risk
- Use side tabs for location of each section in the EAP



Basic EAP Data

- Purpose
- Impacted area
- Dam description
- Directions to the dam



Roles and Responsibilities

- Dam Inspectors & Operators
- Emergency Management Director
- Police & Fire Department
- Dam Operator’s Engineer
- Maryland Dam Safety

Responsibilities of Principals Involved in an EAP

- Dam Inspector or Operator
 - Identify potential emergency conditions
 - Notify emergency management officials
 - Provide updates on changing conditions

Responsibilities of Principals Involved in an EAP

- Emergency Management Director
 - Serve as primary contact for emergencies
 - Prepare emergency management personnel for action
 - Initiate warnings & order evacuations
 - Decide when to terminate the downstream emergency

Responsibilities of Principals Involved in an EAP

- Maryland Dam Safety Engineer
 - Advise on emergency level determination (if time permits)
 - Advise on remedial actions to take (if time permits)
 - Provide technical information on the dam

Responsibilities of Principals Involved in an EAP

- Police & Fire Department Officials
 - Serve as “Incident Commander”
 - Make collective decisions on the incident
 - Conduct evacuations & road closures

Responsibilities of Principals Involved in an EAP

- Dam Operator’s Engineer
 - Provide technical assistance and advice on emergency level determination (if time permits)
 - Provide technical assistance and recommend remedial actions (if time permits)

Step 1: Event Detection

- Flooding
- Spillways
- Seepage
- Sinkholes
- Earthquake
- Embankment overtopping
- Embankment cracking & sliding
- Sabotage

Step 2: Event Level Determination

- Level 1: Non-emergency, unusual event, slowly developing
Monitor
- Level 2: Emergency event, rapidly developing
Could lead to failure
Emerg. Mgt. prepare for evacuations
- Level 3: Urgent event
Imminent dam failure
Emerg. Mgt. immediate evacuations

Emergency Level Guidance Table

Examples of common situations for each emergency level

“Hot Button” Tab

Event	Emergency Level
Reservoir water surface elevation at maximum spillway crest or spillway is rising with no other action	1
Spillway flowing with water gate closure	2
Spillway flow that could result in flooding of people downstream	2
Spillway flowing with an off-normal condition that is threatening the control system	2
Spillway flow that is causing people downstream to flee (e.g., “No, No, No”)	2
Discharging flow not meeting the contractual stage, discharge not regulated in design	2
Discharging flow not meeting the contractual stage, maximum level regulated in design	2
Discharging flow meeting the contractual stage	2
Flow through dam to sea level	2
Flow through dam with small leakage or seepage flow rate	2
Seepage with discharge greater than 10 gallons per minute	2
Seepage with discharge greater than 100 gallons per minute	2
Seepage with discharge greater than 1000 gallons per minute	2
Cracks in the embankment and apron	2
Cracks in the embankment and apron	2
Visual assessment of the embankment stage	2
Failure of slurry (concrete) under the embankment drain	2
Failure of slurry (concrete) under the embankment drain	2
Observed landslides that occurred on or within 100 feet of the dam	2
Observed landslides that occurred on or within 100 feet of the dam	2
Significant flooding in uncontrolled areas of water from the dam	2
Significant flooding in uncontrolled areas of water from the dam	2
Control system malfunctions that could result in damage to the dam	2
Observed landslides that occurred on or within 100 feet of the dam	2
Change in flow or appearance with no report to the Authority of the Dam	2
Change in flow or appearance that could indicate a change in the Authority of the Dam	2
Change in flow or appearance that has resulted in uncontrolled water release	2
Change in flow or appearance that has resulted in uncontrolled water release	2

Step 3: Notification & Communication

- Prescribed messages (for levels 2 & 3) to be used as a guide to communicate status of an event
- Who does what?
 - Flow charts for each event level
 - Includes names & contact information

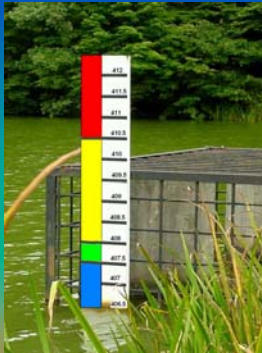
Trigger Elevations Staff Gage



Trigger Elevations Staff Gage



Trigger Elevations Staff Gage



Trigger Elevations Staff Gage



Trigger Elevations Staff Gage



Step 4: Expected Actions

Actions to be taken for each emergency level

Remedial actions (if time permits)

"Hot Button" tab

Step 4: Expected Actions

If the public or staff notices a T-1 call regarding observations of an unusual or emergency event at the dam, the dam should immediately contact the Conservation District office. When the conservation district manager determines the emergency level, the following actions should be taken. If time permits, NRC's and the Oklahoma Water Resources Board should be contacted for technical consultation.

Emergency Level 1 - Non-emergency, unusual event slowly developing:

- The Conservation District Manager should inspect the dam. In a minimum, inspect the full length of the concrete dam, rock, downstream toe, and downstream slope. Also check the concrete, cracks, cracking, or settlement are observed, immediately report the observed conditions to the NRC's and the Oklahoma Water Resources Board. If possible, obtain photographs. At minimum, measure, and determine the appropriate event level for the new condition and recommended actions.
- Record all contacts that were made on the Center's Incident Appendix A. 1. Record all observations, observations, and actions taken on the Event Log (Appendix A. 2). Note the time of changing conditions. Document the situation with photographs and notes, if possible.
- The Conservation District Manager should contact NRC and request technical staff to investigate the situation and recommend corrective actions.

Emergency Level 2 - Potential dam failure imminent, rapidly developing:

- The Conservation District Manager should contact the NRC and the Oklahoma Water Resources Board request for immediate and 24-hour response, request technical staff to investigate the situation and recommend corrective actions.
- The Conservation District Manager should contact the Sheriff to inform him that the E-AP has been activated and if current conditions get worse, an emergency situation may require evacuation. Preparation should be made for possible road closures and evacuations.
- Provide updates to the Sheriff and emergency services personnel to assist them in notifying nearby businesses concerning EAP and emergency road closures, and evacuations.
- If time permits, the Conservation District Manager should inspect the dam. In a minimum, inspect the full length of the concrete dam, rock, downstream toe, and downstream slope. Also check the concrete, cracks, cracking, or settlement are observed, immediately report the observed conditions to the NRC and the Oklahoma Water Resources Board. Obtain photographs. At minimum, measure, and determine the appropriate event level for the new condition and recommended actions.
- Record all contacts that were made on the Center's Incident Appendix A. 1. Record all observations, observations, and actions taken on the Event Log (Appendix A. 2). Note the time of changing conditions. Document the situation with photographs and notes, if possible.
- If time permits, the following emergency remedial actions should be taken in appropriate.

Step 5: Termination & Follow-up

- Dam Owner & Inspectors notify emergency management that emergency at dam is over
- Emergency Management Director terminates EAP operations
- Notify all persons initially contacted to inform them of termination of the emergency event
- Complete emergency situation report

EAP Maintenance

- Annual review and updating
- Table top exercise every five years

Record of Holders of EAP Copies

Copy Number	Organization	Person receiving copy
1	Civil County Conservation District 323 Howard Street Rock City, OH, 96110	John Jordan
2	Civil County Conservation District 323 Howard Street Rock City, OH, 96110	Mike Blain
3	NRC's State Office 323 Howard Street Rock City, OH, 96110	Barby Womers
4	NRC's State Office 3495 Park Road Newark, OH, 96102	Robert Redford
5	Civil County Sheriff's Department 104 Magazine Ave Rock City, OH, 96110	Henry Martin
6	Rock City Building Management 122 Main Street Rock City, OH, 96110	Jeff Powers
7	Rock City Police Department 100 Main Street Rock City, OH, 96110	Bob Jones
8	Oklahoma Water Resources Board 1122 Maple Street Wiring City, OH, 96110	Joe Ottavelli

Concurrences Signatures

Concurrences

By my signature, I acknowledge that I, or my representative, have reviewed this plan and concur with the tasks and responsibilities assigned herein for me and my organization.

1. _____	Agencies	Organization	Date
Printed name and title	Mike Blain, Chair, Civil County Conservation District		
2. _____	Agencies	Organization	Date
Printed name and title	Henry Martin, Sheriff, Civil County		
3. _____	Agencies	Organization	Date
Printed name and title	Jeff Powers, Emergency Management Coordinator, Rock City		
4. _____	Agencies	Organization	Date
Printed name and title	Bob Jones, Chief of Police, Rock City		
5. _____	Agencies	Organization	Date
Printed name and title	Barby Womers, District Conservationist, NRC, Rock City		
6. _____	Agencies	Organization	Date
Printed name and title			
7. _____	Agencies	Organization	Date
Printed name and title			

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Printed name and title	Barby Womers, District Conservationist, NRC, Rock City		
6. _____	Agencies	Organization	Date
Printed name and title			
7. _____	Agencies	Organization	Date
Printed name and title			

Appendix A

Contact Checklist

**Appendix A-1
Contact Checklist**

Rock Creek Watershed, Dam Number 21
Civil County, Oklahoma

The following contacts should be made immediately after the emergency level is determined (see page 7-16) for the purpose to determine the appropriate emergency level for a specific situation. The person making the contacts should initial and record the time of the call and also was notified for each contact made. Use the Concurrence Form for initial contact referencing self page 16 for contact information for other possible emergency services.

Emergency Level 1 (see page 11)	Person Contacted	Date Contacted	Contacted by
_____	NRC's District Conservationist	_____	_____
_____	NRC's State Conservation Engineer	_____	_____
_____	Oklahoma Water Resources Board	_____	_____
_____	NRC's District Conservationist	_____	_____
_____	NRC's State Conservation Engineer	_____	_____
_____	Oklahoma Water Resources Board	_____	_____
_____	Ward	_____	_____
_____	Ward	_____	_____
_____	Ward	_____	_____
_____	Ward	_____	_____
_____	Oklahoma Water Resources Board	_____	_____
_____	NRC's District Conservationist	_____	_____
_____	NRC's State Conservation Engineer	_____	_____

Appendix B

People At-Risk

“Hot Button” tab

Appendix B-5: Residents/Businesses/Highways at Risk

A major flood caused by a million branch of the dam is estimated to inundate six homes, three businesses, and three highways. These homes and businesses checked on the evacuation maps are located east of OK Highway 44 and south of Chastain Street in Rock City.

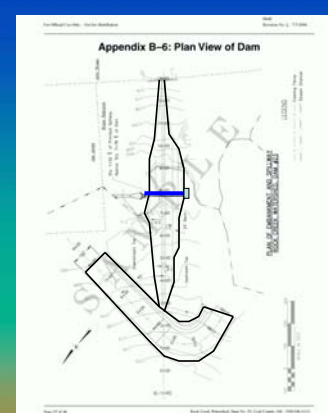
House No. #	Residence/Business	Address	Phone no.	Business Hours	Brand	Max water depth above first floor (ft)
1	Food and Retail Store	10100 E. 12th St.	515-XXXX-XXXX	8:00am - 5:00pm	IGA	0.3
B-2	Larry's Hardware	1214 Chastain	515-XXXX-XXXX	7:00am - 7:00pm	IGA	0.9
B-3	Lane's Hardware	2204 East Road	515-XXXX-XXXX	11:00am - 6:00pm	IGA	2.0
B-4	Bob's Coffee Shop	1417 Eagle St.	515-XXXX-XXXX	11:00am - 10:00pm	IGA	4.8
5	Tony and Ann Smith	4812 Chastain	515-XXXX-XXXX	11:00am - 11:00pm	IGA	3.0
6	Anna Hill	1300 Apple Road	515-XXXX-XXXX	10:00am - 11:00pm	IGA	3.2
7	Allen and Ruth Jones	4814 Chastain	515-XXXX-XXXX	10:00am - 11:00pm	IGA	3.2
8	Mike and Carol Green	4812 Chastain	515-XXXX-XXXX	10:00am - 11:00pm	IGA	2.8
9	Stephanie Evans	4812 Chastain	515-XXXX-XXXX	14:20pm - 11:00pm	IGA	0.5
OK Highway 44				2:00pm - 10:00pm	IGA	2.8
Interstate 40				10:00am - 10:00pm	IGA	3.4
OK Route 40				11:30am - 10:00pm	IGA	3.4

* See Appendix B-4.
** Estimated depth for branch water (equal) to travel from dam to destination locations.

Basis for computation of evacuation area and flooding depths
Branch inundated based on model by SAC, August 2004.
Hydraulic model used: SAC 2.18. 2D (steady) 78-80 (peak discharge), 78-80 (hydrograph).
Model assumptions:
• "Storm Day" (branch flow into the reservoir)
• Water surface in reservoir prior to breach = 1,176.2 (top of dam)
• Total volume of branch to discharge = 2,345 ac-ft
• Height of water at time of breach = 1.5 ft
• Peak branch discharge = 45,760 cfs
• Evacuation area defined by flood barriers consisting of 10 cross sections & 3 bridge openings.

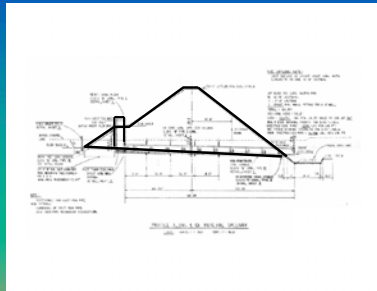
Appendix B

Plan View of Dam



Appendix B

Profile View of Dam



Limited EAP Distribution

Control numbers on each copy to assure revisions are made to all original copies (see cover & page 22)

Remember – This is Model EAP that needs to be customized for your dam !

Adapt the format and content as necessary to meet:

- Local emergency management desires
- Site-specific situation

Exercising the EAP: Nonstop laughs!



