

**NEW MEXICO OFFICE OF THE STATE ENGINEER**  
**Dam Safety Bureau**  
**Emergency Action Plans for Dams**  
**March 29, 2011**

An Emergency Action Plan (EAP) is critical for protecting the dam, downstream communities and personnel that work at the dam. The EAP assists a Dam Owner in recognizing emergency and non-emergency events and to respond appropriately. The EAP also provides Local Emergency Officials with the inundation map to assist in developing an evacuation map. This paper supports the model EAP on the Office of the State Engineer (OSE) website at:

[http://www.ose.state.nm.us/water\\_info\\_dam\\_safety\\_info.html](http://www.ose.state.nm.us/water_info_dam_safety_info.html)

A Professional Engineer is not required to prepare the entire EAP. A Professional Engineer is responsible for preparing Event Level Determination (Step 2), Remedial Actions listed in Expected Actions (Step 4), Evacuation Map, Inundation Map and Metadata documentation for EAP maps. If the Local Emergency Official requests changes to the model EAP that addresses emergency response, these changes are acceptable to the OSE and must be documented. Checklists are provided at the end of this paper for documenting the coordination with the Local Emergency Official and changes required by the Local Emergency Official. The Coordination Checklists must be completed by the EAP Preparer and Engineer and accompany the EAP to the OSE for review.

**EAP Certifications**

Certifications for the Dam Owner, Engineer, Local Emergency Official, State Emergency Official and State Engineer are required. The State Engineer will be the last certification signed.

**Basic EAP Data**

This information must be customized for each dam. A general description of the impacted area from the Evacuation Map is required. A reference to only the Evacuation Map in lieu of a description is not acceptable.

**EAP Overview**

This section is generic and generally requires no change. If the Local Emergency Official requires a change, document the changes in the transmittal letter.

**Roles and Responsibilities**

This section is to educate the Dam Owner on the roles and responsibilities during an emergency. It is not intended to fully define the roles of the Local Emergency Official or Incident Commander. Titles rather than individuals should be listed. The EAP Preparer must document any changes required to the roles and responsibilities of the Local Emergency Official and Incident Commander. (See attached EAP Preparer's Coordination Checklist.)

**Event Detection – Step 1**

This information may require some customization of the first two bullet items. If restricted access prevents visual observation or no instrumentation exists, the first two bullets will require revision.

### **Event Determination (Step 2)**

This section is a critical element of the EAP and must provide clear direction to the Dam Owner to evaluate and classify an event. The “Guidance for Determining the Emergency Level” and “Examples of Emergency Situations” are engineering elements of the EAP and a Professional Engineer must prepare Step 2. The Engineer must coordinate with the Dam Owner and Local Emergency Official to complete this step. The Dam Owner must decide if notifications will be given during an emergency flood event that is not threatening the safety of the dam. If notification will be given, examples must be provided in the EAP. The model EAP provides example situations for dams with different purposes and appurtenant structures. The example situations provided in the “Guidance for Determining the Emergency Level” and “Examples of Emergency Situations” must be customized for the specific dam by the Engineer. The Engineer must advise the Local Emergency Official of the time it takes for the leading edge of the flood wave to reach the first populated location. The time presented is obtained from the Breach Analysis and Flood Routing Report that has been reviewed and approved by the OSE. When determining the time from the outflow hydrograph, time begins once the reservoir is exposed in a breach to the time the leading edge arrives at the point of interest downstream. A conservative approach in estimating travel time (less time) is required. Engineers must also request information on notification times and evacuation times from the Local Emergency Official. Emergency response times will assist the Engineer in determining the appropriate emergency levels (1, 2 or 3) for the various examples included in the EAP. The Engineer must document coordination with the Local Emergency Official. (See attached Professional Engineer’s Coordination Checklist.)

### **Notification and Communication (Step 3)**

The Local Emergency Official may request changing the communication language or the order of calls for Emergency Levels 2 and 3, which are emergency response events. Because Emergency Level 1 may not include the Local Emergency Official, changes to the communication language are not anticipated. The EAP Preparer must document any changes in notification and communication. (See attached EAP Preparer’s Coordination Checklist.)

### **Notification Flow Charts**

It is acceptable to use Titles rather than name individuals in the Notification Flow Charts. Information on the National Weather Service is attached. The Local Emergency Official may request to be notified first in a Level 2 Emergency. This change is acceptable. The EAP Preparer must document input from the Local Emergency Official. (See attached EAP Preparer’s Coordination Checklist.)

### **Emergency Services Contacts**

This table must be customized with other emergency services contacts not listed in the Notification Flow Charts. Back up contacts must be listed. Input from the Local Emergency Official must be documented. (See attached EAP Preparer’s Coordination Checklist.)

### **Expected Actions (Step 4)**

This section is a critical element of the EAP and identifies the expected actions the Dam Owner must take at each emergency level. Expected actions at each emergency level must correspond with the order identified in the Notification Flow Charts. Emergency Level 2 provides a list of

emergency remedial actions that a Dam Owner must take to try and save the dam. Emergency remedial actions are an engineering element of the EAP and a Professional Engineer must prepare these remedial actions. The remedial actions must be customized for the individual dam and the actions must respond to the situations identified in Step 2. The Engineer must evaluate each example and decide if it is a realistic option or if other measures should be added that are not included in the model EAP example.

### **Termination (Step 5)**

The Local Emergency Official may require changes to the termination processes. Changes by the Local Emergency Official must be documented. (See attached EAP Preparer's Coordination Checklist.)

### **Maintenance – EAP Review, Revision and Exercise**

Changes to the frequency of exercising the EAP must be coordinated with the Local Emergency Official. Changes by the Local Emergency Official must be documented. (See attached EAP Preparer's Coordination Checklist.) The Local Emergency Official may schedule one table top exercise for multiple dams, which is acceptable to the OSE. The Dam Owner must contact the Local Emergency Official to schedule and coordinate an exercise.

### **Record of Holders of Control Copies of this EAP**

Copies must be provided to the Dam Owner, Owner's Engineer, Local Emergency Official, Other Stakeholders, State Emergency Official, State Engineer, "Local" National Weather Service (NWS) Office and NWS River Forecast Center (see attached NWS information). Additional copies for local emergency responders are at the direction of the Local Emergency Official. The EAP Preparer must document the direction provided by the Local Emergency Official. (See attached EAP Preparer's Coordination Checklist.)

### **Record of Revisions and Updates made to the EAP**

The Dam Owner must document the revisions made to the EAP over time. Copies of the Revision Page and all updates must be provided to each Controlled Copy Holder listed on the previous page.

### **Concurrences**

The need for a Concurrence page of signatures for those not listed in the certification is at the direction of the Local Emergency Official. The Local Emergency Official may require a tabletop exercise in lieu of completing this page. Omit the page if it is not required and renumber accordingly. The EAP Preparer must document the direction provided by the Local Emergency Official. (See attached EAP Preparer's Coordination Checklist.)

### **Appendix A**

Appendix A is generic and generally requires no change by the Dam Owner. The forms are intended to be completed by the Dam Owner. The Local Emergency Official may request additional forms. The EAP Preparer must document the direction provided by the Local Emergency Official. (See attached EAP Preparer's Coordination Checklist.)

### **Resources Available**

Any resources needed to perform the Emergency Remedial Actions listed in Emergency Level 2 must be included in Appendix B-1. Identifying the resources needed may require coordination with the Engineer who is completing Step 4 of the EAP.

### **Location and Vicinity Map**

Appendix B-2 must provide clear directions for emergency responders.

### **Evacuation Map**

The Evacuation Map in Appendix B-3 must be prepared by a Professional Engineer with input from the Local Emergency Official. The Professional Engineer must assist the Local Emergency Official in understanding the timing and depth of the flood wave and limitations of the inundation map. The Engineer should consider introducing the Local Emergency Official to ACER 11<sup>1</sup> to assist in determining what areas need to be evacuated. The timing of the flood versus the time for notifications and evacuations must be coordinated in order to complete the “Guidance for Determining the Emergency Level” listed in Step 2. OSE Rules and Regulations (Subsection E of 19.25.12.18 NMAC) lists the information that may be included on an evacuation map at critical locations downstream. Engineers must coordinate the need for specific information with the Local Emergency Official. The Evacuation Map must contain a disclaimer of limitations of the evacuation maps. For example, if the dam is on a minor tributary and fails from over topping during a storm event, the flood conditions assumed for the major tributary downstream must be identified on the Evacuation Map. Coordination with the Local Emergency Official to meet their GIS needs is also required, if the data is available. The Engineer must document coordination with the Local Emergency Official. (See attached Professional Engineer’s Coordination Checklist.)

### **People at Risk**

Appendix B-4 must provide a general description of the area impacted if the area is too large to list individuals. A list of hospitals, schools and other critically occupied buildings must be listed if required by the Local Emergency Official. The EAP Preparer must document the direction provided by the Local Emergency Official. (See attached EAP Preparer’s Coordination Checklist.)

### **Inundation Maps**

The Inundation Maps in Appendix B-5 must be prepared by a Professional Engineer. The Inundation Maps are developed from the dam breach models. The OSE requires advance coordination before a simplified dam breach analysis will be approved. Currently, the OSE evaluates the threat to life and property using ACER 11. Figure 6 of ACER 11 for children is used unless the situation justifies a less conservative approach.

If GIS shape files for the inundation maps are available, the OSE requires the shape files to be geo-referenced in the “NAD1983, UTM, Zone 13N” standard GIS projection. The Geographic Coordinate System is “GCS\_North American\_1983”.

<sup>1</sup> ACER Technical Memorandum 11, Downstream Hazard Classification Guidelines, U.S. Bureau of Reclamation, 1988, Figure 2 through Figure 6.

A disclaimer recognizing the uncertainties of the Inundation Map must be included on all Inundation Maps to assist the Local Emergency Official in developing the Evacuation Maps. An example disclaimer is provided below, which may be altered for the specific circumstances.

“Inundation zones are based solely on flood waters from the watershed above the Dam. No downstream contributing tributary flow is considered. Methods, procedures and assumptions used to develop the flooded areas, the limits of flooding shown and flood wave travel times are approximate and should only be used as a guideline for establishing evacuation zones. Actual areas inundated will depend on actual failure of flood conditions and may differ from areas shown on the maps.”

**Construction Drawings of the Dam**

A plan view (Appendix B-6); profile of the dam along the outlet conduit and maximum section; and elevation, storage and discharge table are required, if available.

**NWS Contact Information**  
(Verify contact information on the Internet)

**Local Office:**

**Dona Ana, Grant, Hidalgo, Luna, Sierra and Otero Counties:**

Santa Teresa Office  
575-589-3972 (24/7 number for Notification Flow Chart)  
7955 Airport Road  
Santa Teresa, NM 88008

**Eddy and Lea Counties:**

Midland/Odessa Office  
432-563-6217 (24/7 number for Notification Flow Chart)  
2500 Challenger Dr.  
Midland, TX 79706-2606

**All other NM Counties:**

Albuquerque Office  
505-244-9148 (24/7 number for Notification Flow Chart)  
2341 Clark Carr Loop, SE  
Albuquerque, NM 87106

**River Forecast Centers:** (<http://water.weather.gov/ahps/rfc/rfc.php>)

**West of the Continental Divide:**

Colorado Basin River Forecast Center  
2242 W. North Temple  
Salt Lake City, UT 84116  
801-524-5130

**Rio Grande and Pecos Basins:**

West Gulf River Forecast Center  
3401 Northern Cross Blvd.  
Fort Worth, TX 76137  
817-831-3289

**Canadian Basin:**

Arkansas-Red Basin River Forecast Center  
10159 E. 11<sup>th</sup> Street, Suite 300  
Tulsa, OK 74128-3050  
918-832-4110

## EAP Preparer’s documentation of coordination with Local Emergency Official Emergency Elements of the EAP Checklist

Meeting Date and Location: \_\_\_\_\_

<b>Emergency Elements of the EAP</b>	<b>Verified by Local Emergency Official</b>	
	<b>Yes/No</b>	<b>Document the Local Emergency Official’s requested change from the Model EAP</b>
Role and Responsibility of the Local Emergency Official		
Role and Responsibility of the Incident Commander		
Emergency Level 2 and 3 Communication customized		
Emergency Level 2 and 3 Notification Flow Charts customized		
Emergency Services Contacts		
Termination customized		
Exercise Frequencies		
Controlled copies provided to appropriate emergency responders and affected stakeholders		
Concurrence page		
Additional Emergency Forms (Appendix A-4)		
Residents/Business/Highways at Risk		

See OSE Paper “Emergency Action Plans for Dams” for additional guidance.

EAP Preparer’s Signature and Date: \_\_\_\_\_

Print EAP Preparer’s Name: \_\_\_\_\_

Print EAP Preparer’s Title: \_\_\_\_\_

**Professional Engineer’s documentation of coordinating  
the EAP with the Local Emergency Official  
Engineering Elements of the EAP Checklist**

Meeting Date and Location: \_\_\_\_\_

<b>Guidelines for determining the Emergency Level</b>	<b>Yes</b>	<b>Comments</b>
Local Emergency Official provided the estimated time needed to notify closest downstream residents		
Local Emergency Official provided the estimated time needed to evacuate the closest downstream residents		
<b>Evacuation Map</b>	<b>Required by the Local Emergency Official</b>	
	<b>Yes</b>	<b>Comments</b>
Extends to a location where consequences of dam failure no longer requires evacuation		
Cross-sections show distance from the dam		
Cross-sections show travel time of the leading edge of the flood wave		
Cross-sections show peak flow in cfs		
Cross-sections show incremental rise of water surface elevation above base flow in feet.		
Cross-sections show water surface elevation in feet		
Cross-sections show average or peak velocity of the flood wave		
Road, bridge, railroad or trail blockages identified for closure		
Critical facilities or infrastructure identified		
Evacuation routes identified		
Location of evacuation centers identified or described if outside the map extents		
Shape files of map requested and appropriately geo-referenced for local needs		

Engineer’s Stamp, signature and Date: