

# **Emergency Action Plan (EAP)**

**Name of Dam**

**National Inventory of Dams (NID) No. *OK*\_\_\_\_\_**

**Legal Location of Dam**

**Name of County County, Oklahoma**

Prepared by:

---

*Name*

---

*Date*

# Contents

Basic EAP Data.....	2
Roles and Responsibilities .....	3
Notification Charts.....	5
Other Emergency Services Contacts.....	8
Concurrences.....	9
Record of Holders of Control Copies of this EAP.....	10
EAP Overview .....	11
The Five-step EAP Process	
Step 1    Event Detection .....	12
Step 2    Emergency Level Determination .....	13
Guidance for Determining the Emergency Level .....	14
Examples of Emergency Situations .....	15
Step 3    Notification and Communication.....	16
Step 4    Expected Actions .....	17
Step 5    Termination.....	18
Maintenance—EAP Review and Revision .....	21
Appendices—Forms, Glossary, Maps, and Supporting Data .....	22
Appendix A – Forms and Glossary	
Record of Revisions and Updates Made to EAP .....	26
Contact Checklist .....	27
Unusual or Emergency Event Log Form .....	28
Dam Emergency Situation Report Form.....	29
Glossary of Terms.....	30
Appendix B – Maps and Supporting Data	
Resources Available.....	34
Location and Vicinity Maps.....	35
Inundation Map .....	36
Residents/Businesses/Highways at Risk.....	37
Plans and Drawings of Dam .....	38
Reservoir Elevation-area-volume and Spillway Capacity Data.....	39
National Inventory of Dams (NID) Data .....	40

# Basic EAP Data

## Purpose

The purpose of this EAP is to reduce the risk of human life loss and injury and minimize property damage during an unusual or emergency event at Name of Dam.

## Potential Impacted Area

See *Residents/Businesses/Highways at Risk* (page 37) 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:

*(Describe homes, businesses, and roads in downstream inundation area)*

## Dam Description

National Inventory of Dams No.:

Hazard Classification:

Dam Owner:

Major Property Owner:

Height:           ft

Drainage Area:           sq. mi

Year Built:

Maximum Storage:           acre-feet

Legal Description:

Latitude:                   Longitude:

See detailed design data in *Appendix B* tab.

**Directions to dam** (See *Location and Vicinity Map* – page 35.)

*(Provide directions to dam from nearest town)*

# Roles and Responsibilities

## **Dam Owner's Representative** - Name of Representative

- As soon as an emergency event is observed or reported, immediately determine the emergency level (see *Emergency Levels*).
  - Level 1: unusual event, slowly developing
  - Level 2: potential dam failure situation, rapidly developing
  - Level 3: dam failure appears imminent or is in progress
- Immediately notify the personnel in the order shown on the notification chart for the appropriate level (see *Notification Charts*).
- Provide updates of the situation to the police/sheriff dispatcher to assist them in making timely and accurate decisions regarding warnings and evacuations.
- Provide leadership to assure the EAP is reviewed and updated annually and copies of the revised EAP are distributed to all who received copies of the original EAP.

## **Law Enforcement Agency** - Name of Representative, Title, & Agency

- Serve as the primary contact person responsible for coordination of all emergency actions.
- When a Level 2 situation occurs: Prepare emergency management personnel for possible evacuations that may be needed if a Level 3 situation occurs.
- When a Level 3 situation occurs:
  - Initiate warnings and order evacuation of people at risk downstream of the dam.
  - Notify local emergency management services to carry out the evacuation of people and close roads within the evacuation area (see *Inundation Map*).
- Decide when to terminate the emergency.
- Participate in an annual review and update of the EAP.

## **Emergency Management Services** - Name & Title

- Maintain communication with media.
- When a Level 2 situation occurs:
  - Prepare emergency management personnel for possible evacuations that may be needed if a Level 3 situation occurs.
  - Alert the public as appropriate.
- When a Level 3 situation occurs:
  - Alert the public.
  - Immediately close roads and evacuate people within the evacuation area (see *Inundation Map*).
- Participate in an annual review and update of the EAP.

## **Dam Owner's Engineering Representative** - Name

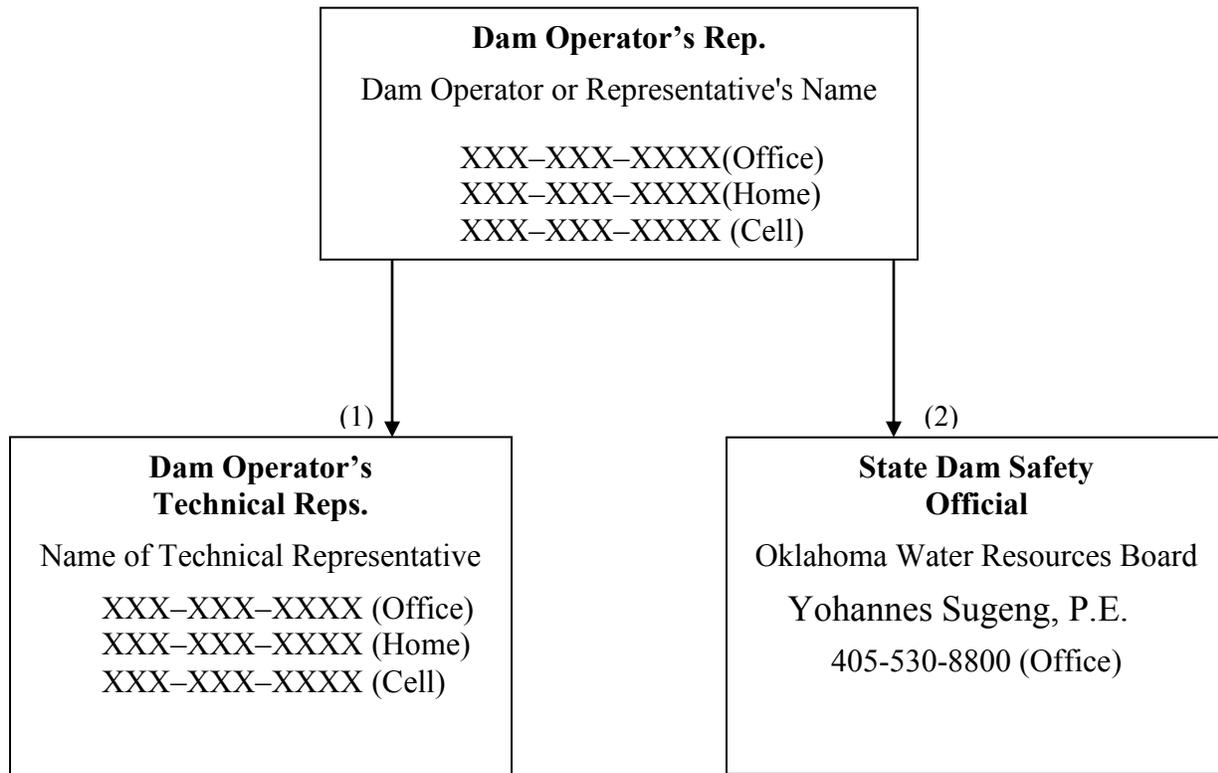
- Advise the dam operator of the emergency level determination, if time permits.
- Advise the dam operator of remedial actions to take if Level 2 event occurs, if time permits.

## **State Dam Safety Agency – Oklahoma Water Resources Board**

- Advise the dam operator of the emergency level determination, if time permits.
- Advise the dam operator of remedial actions to take if Level 2 event occurs, if time permits.

# Emergency Level 1 Notifications

## Nonemergency Unusual Event; Slowly Developing



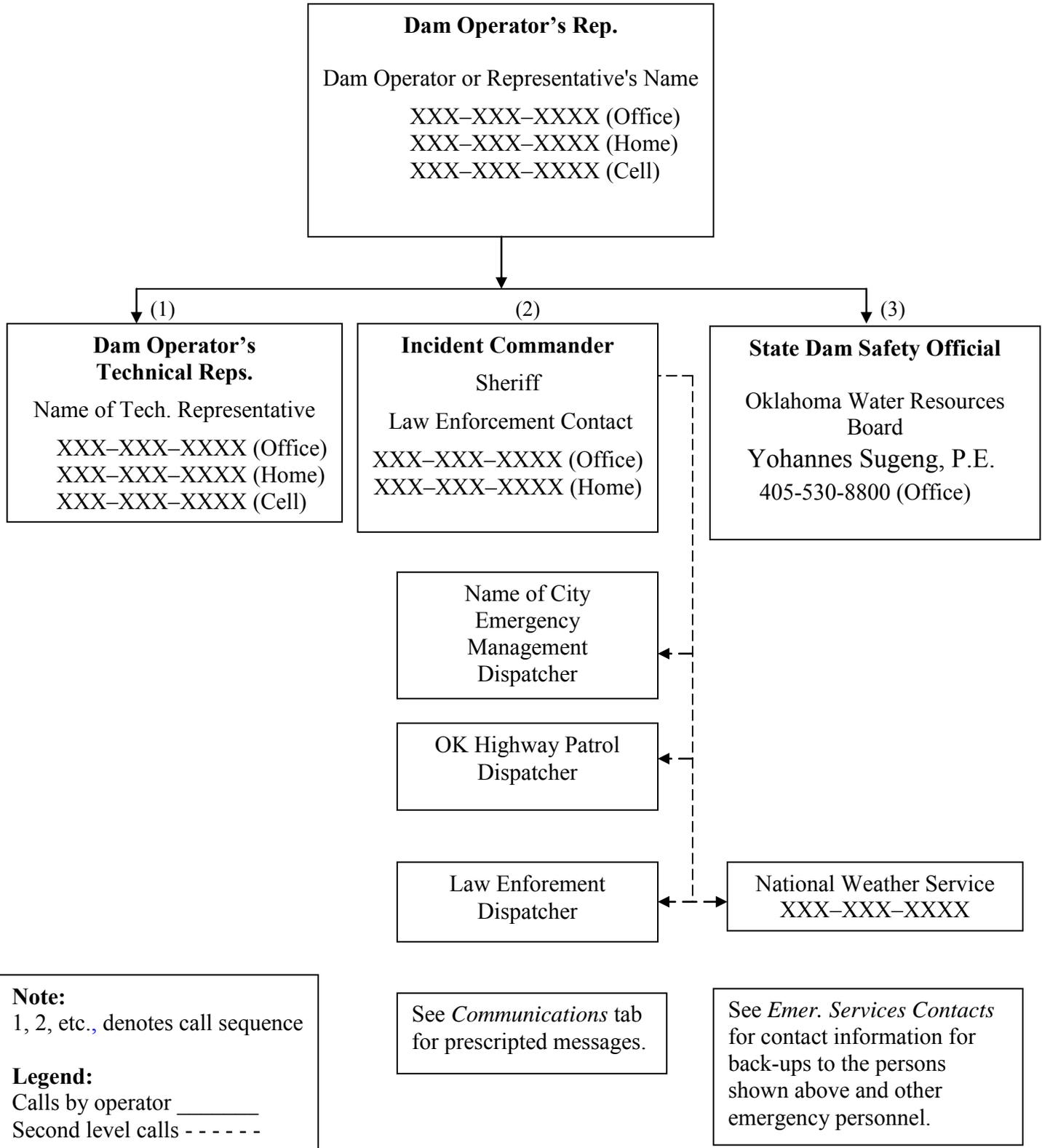
**Note:**  
1, 2, etc., denotes call sequence

**Legend:**  
Calls by operator \_\_\_\_\_  
Second level calls - - - - -

See *Emer. Services Contacts* for contact information for back-ups to the persons shown above and other emergency personnel.

# Emergency Level 2 Notifications

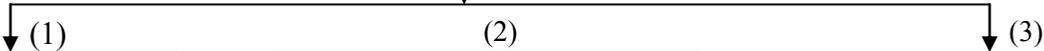
## Emergency Event, Potential Dam Failure Situation; Rapidly Developing



# Emergency Level 3 Notifications

## Urgent Event, Dam Failure Appears Imminent or Is In Progress

**Dam Operator's Rep.**  
 Dam Operator or Representative's Name  
 XXX-XXX-XXXX (Office)  
 XXX-XXX-XXXX (Home)  
 XXX-XXX-XXXX (Cell)



(1)  
**Incident Commander**  
*Law Enforcement Contact*  
 XXX-XXX-XXXX (Office)  
 XXX-XXX-XXXX (Home)  
 XXX-XXX-XXXX (Cell)  
 or  
 24-Hour 911

(2)  
**State Dam Safety Official**  
 Oklahoma Water Resources Board  
 Yohannes Sugeng, P.E.  
 405-530-8800 (Office)

(3)  
**Dam Operator's Technical Reps.**  
 Name of Tech Rep  
 XXX-XXX-XXXX (Office)  
 XXX-XXX-XXXX (Home)  
 XXX-XXX-XXXX (Cell)

Name Emergency Management Dispatcher

National Weather Service  
 XXX-XXX-XXXX

OK Highway Patrol Dispatcher

Law Enforcement Dispatcher

**Note:**  
 1, 2, etc., denotes call sequence

**Legend**  
 Calls by operator \_\_\_\_\_  
 Second level calls - - - - -

See *Communications* tab for prescribed messages.

See *Emer. Services Contacts* for contact information for back-ups to the persons shown above and other emergency personnel.

### Emergency Services Contacts

Agency / Organization	Principal contact	Address	Office telephone number	Alternate telephone numbers
Emergency Management Coordinator				
Fire Department				
Police Department				
Sheriff Office				
Oklahoma Highway Patrol				
Oklahoma Water Resources Board	Yohannes Sugeng, P.E. Dam Safety Engineer	3800 N. Classen Blvd. Oklahoma City, OK	405-530-8800	
Oklahoma Department of Transportation				
County Commissioner				
Landowners Downstream of Dam				

# 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. Printed name and title: Name of Owner , Dam Owner

---

*Signature* *Organization* *Date*

2. Printed name and title: Name, Sheriff, Name of County County

---

*Signature* *Organization* *Date*

3. Printed name and title: Name, Emergency Management Coordinator

---

*Signature* *Organization* *Date*

4. Printed name and title: Name , Chief of Police, Name of City

---

*Signature* *Organization* *Date*

5. Printed name and title:

---

*Signature* *Organization* *Date*

6. Printed name and title:

---

*Signature* *Organization* *Date*

7. Printed name and title: Name, **Oklahoma Dam Safety Program**

---

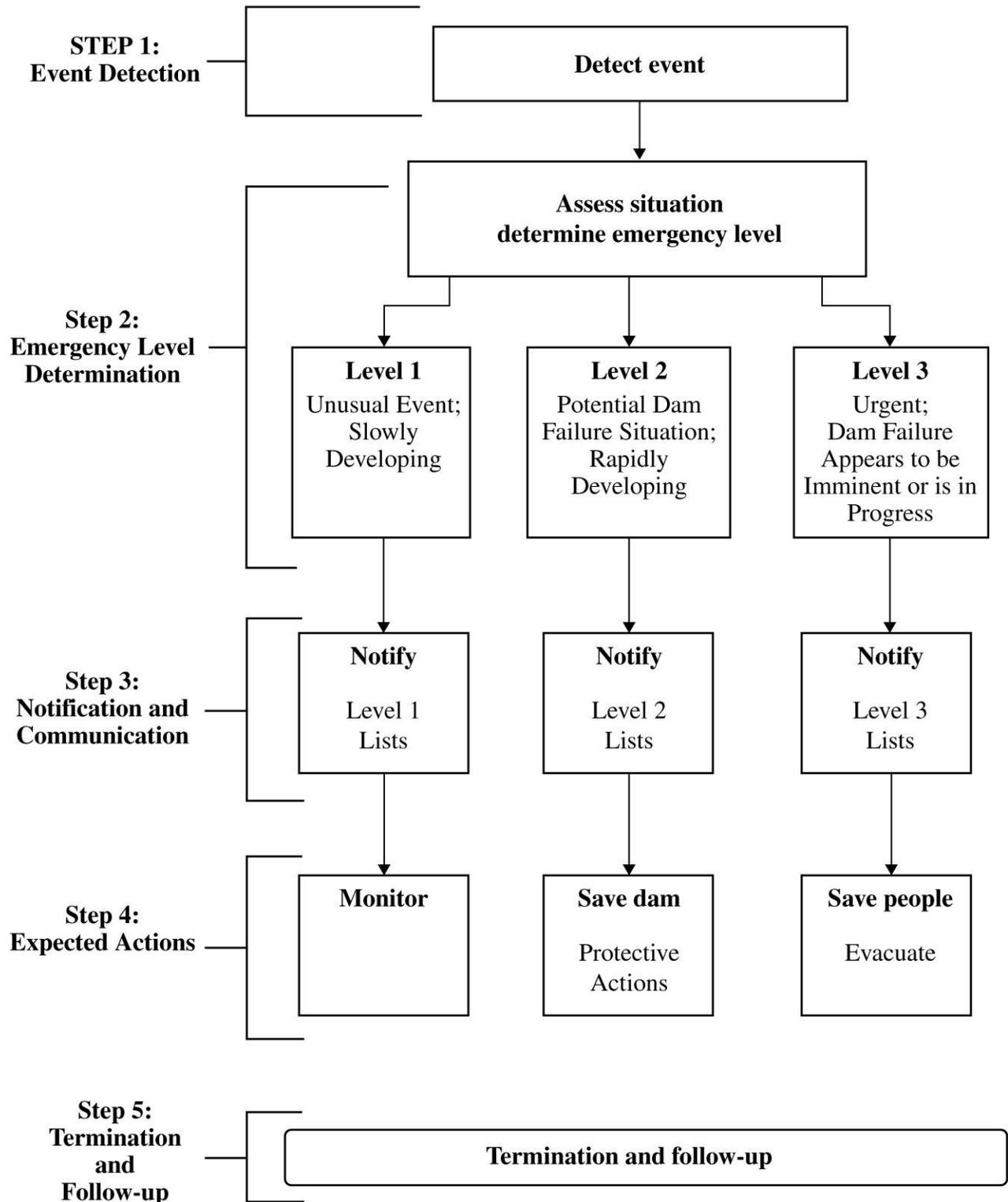
*Signature* *Organization* *Date*

Oklahoma Water Resources Board

## Record of Holders of Control Copies of this EAP

Copy Number	Organization	Person receiving copy
1		
2		
3		
4		
5		
6		
7		
8	<b>Oklahoma Water Resources Board</b> 3800 N. Classen Blvd. Oklahoma City, OK 73118	Yohannes Sugeng, P.E.

# EAP Overview



# The Five-step EAP Process

## *Step 1 Event Detection*

This step describes the detection of an unusual or emergency event and provides information to assist the dam operator in determining the appropriate emergency level for the event.

Unusual or emergency events may be detected by:

- Observations at or near the dam by government personnel (local, state, or Federal), landowners, visitors to the dam, or the public
- Evaluation of instrumentation data
- Earthquakes felt or reported in the vicinity of the dam
- Forewarning of conditions that may cause an unusual event or emergency event at the dam (for example, a severe weather or flash flood forecast)

See *Guidance for Determining the Emergency Level* table for assistance in evaluating specific events to determine if they are unusual or potential emergency situations.

## *Step 2 Emergency Level Determination*

After an unusual or emergency event is detected or reported, the dam owner or his alternate is responsible for classifying the event into one of the following three emergency levels:

### **Emergency Level 1—Nonemergency, unusual event, slowly developing:**

This situation is not normal but has not yet threatened the operation or structural integrity of the dam, but possibly could if it continues to develop. Dam technical representatives or state dam safety officials should be contacted to investigate the situation and recommend actions to take. The condition of the dam should be closely monitored, especially during storm events, to detect any development of a potential or imminent dam failure situation. The Emergency Manager should be informed if it is determined that the conditions may possibly develop into a worse condition that may require emergency actions.

### **Emergency Level 2—Potential dam failure situation, rapidly developing:**

This situation may eventually lead to dam failure and flash flooding downstream, but there is not an immediate threat of dam failure. The Sheriff should be notified of this emergency situation and placed on alert. The dam operator should closely monitor the condition of the dam and periodically report the status of the situation to the Sheriff. If the dam condition worsens and failure becomes imminent, the Sheriff must be notified immediately of the change in the emergency level to evacuate the people at risk downstream.

If time permits, NRCS and state dam safety officials should be contacted to evaluate the situation and recommend remedial actions to prevent failure of the dam. The dam operator should initiate remedial repairs (note local resources that may be available—see Appendix B-1). Time available to employ remedial actions may be hours or days.

This emergency level is also applicable when flow through the earth spillway has or is expected to result in flooding of downstream areas and people near the channel could be endangered. Emergency services should be on alert to initiate evacuations or road closures if the flooding increases.

### **Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

This is an extremely urgent situation when a dam failure is occurring or obviously is about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. This situation is also applicable when flow through the earth spillway is causing downstream flooding of people and roads. The Sheriff should be contacted immediately so emergency services can begin evacuations of all at-risk people and close roads as needed (see *Inundation Map* – Appendix B-3).

**See the following pages for guidance in determining the proper emergency level for various situations.**

## Guidance for Determining the Emergency Level

Event	Situation	Emergency level*
Earth spillway flow	Reservoir water surface elevation at auxiliary spillway crest or spillway is flowing with no active erosion	1
	Spillway flowing with active gully erosion	2
	Spillway flow that could result in flooding of people downstream if the reservoir level continues to rise	2
	Spillway flowing with an advancing head cut that is threatening the control section	3
	Spillway flow that is flooding people downstream	3
Embankment overtopping	Reservoir level is 1 foot below the top of the dam	2
	Water from the reservoir is flowing over the top of the dam	3
Seepage	New seepage areas in or near the dam	1
	New seepage areas with cloudy discharge or increasing flow rate	2
	Seepage with discharge greater than 10 gallons per minute	3
Sinkholes	Observation of new sinkhole in reservoir area or on embankment	2
	Rapidly enlarging sinkhole	3
Embankment cracking	New cracks in the embankment greater than ¼-inch wide without seepage	1
	Cracks in the embankment with seepage	2
Embankment movement	Visual movement/slippage of the embankment slope	1
	Sudden or rapidly proceeding slides of the embankment slopes	3
Instruments	Instrumentation readings beyond predetermined values	1
Earthquake	Measurable earthquake felt or reported on or within 50 miles of the dam	1
	Earthquake resulting in visible damage to the dam or appurtenances	2
	Earthquake resulting in uncontrolled release of water from the dam	3
Security threat	Verified bomb threat that, if carried out, could result in damage to the dam	2
	Detonated bomb that has resulted in damage to the dam or appurtenances	3
Sabotage/ vandalism	Damage to dam or appurtenance with no impacts to the functioning of the dam	1
	Modification to the dam or appurtenances that could adversely impact the functioning of the dam	1
	Damage to dam or appurtenances that has resulted in seepage flow	2
	Damage to dam or appurtenances that has resulted in uncontrolled water release	3

\* Emergency Level 1: Nonemergency unusual event, slowly developing

\* Emergency Level 2: Potential dam failure situation, rapidly developing

\* Emergency Level 3: Urgent; dam failure appears imminent or is in progress

## Examples of Emergency Situations

The following are examples of conditions that usually constitute an emergency situation that may occur at a dam. Adverse or unusual conditions that can cause the failure of a dam are typically related to aging or design and construction oversights. Extreme weather events that exceed the original designed conditions can cause significant flow through the auxiliary spillway or overtopping of the embankment. However, accidental or intentional damage to the dam may also result in emergency conditions. The conditions have been grouped to identify the most likely emergency-level condition. The groupings are provided as guidance only. Not all emergency conditions may be listed, and the dam operator is urged to use conservative judgment in determining whether a specific condition should be defined as an emergency situation at the dam.

**Pre-existing conditions on this dam:** There has been a small seepage area near the downstream toe on the north side of the release channel. This was first noticed in the 1990s, but has not changed since that time.

### Earth Spillway Flows

#### **Emergency Level 2—Potential dam failure situation; rapidly developing:**

1. Significant erosion or head cutting of the spillway is occurring, but the rate does not appear to threaten an imminent breach of the spillway crest that would result in an uncontrolled release of the reservoir.
2. Flow through the earth auxiliary spillway is or is expected to cause flooding that could threaten people, homes, and/or roads downstream from the dam.

#### **Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

1. Significant erosion or head cutting of the spillway is occurring at a rapid rate, and a breach of the control section appears imminent.
2. Flow through the earth auxiliary spillway is causing flooding that is threatening people, homes, and/or roads downstream from the dam.

### Embankment Overtopping

#### **Emergency Level 2—Potential dam failure situation; rapidly developing:**

1. The reservoir level is within 1 foot from the top of the dam.

#### **Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

1. The reservoir level has exceeded the top of the dam, and flow is occurring over the embankment.

## **Seepage and Sinkholes**

### **Emergency Level 2—Potential dam failure situation; rapidly developing:**

1. Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.
2. New or increased areas of wet or muddy soils are present on the downstream slope, abutment, and/or foundation of the dam, and there is an easily detectable and unusual increase in volume of downstream seepage.
3. Significant new or enlarging sinkhole(s) near the dam or settlement of the dam is observed.
4. Reservoir level is falling without apparent cause.
5. The following known dam defects are or will soon be inundated by a rise in the reservoir:
  - Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
  - Transverse cracks extending through the dam, abutments, or foundation.

### **Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

1. Rapidly increasing cloudy seepage or soil deposits at seepage exit points to the extent that failure appears imminent or is in progress.
2. Rapid increase in volume of downstream seepage to the extent that failure appears imminent or is in progress.
3. Water flowing out of holes in the downstream slope, abutment, and/or foundation of the dam to the extent that failure appears imminent or is in progress.
4. Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
5. Rapidly enlarging sinkhole(s) are forming on the dam or abutments to the extent that failure appears imminent or is in progress.
6. Rapidly increasing flow through crack(s) eroding materials to the extent that failure appears imminent or is in progress.

## **Embankment Movement and Cracking**

### **Emergency Level 2—Potential dam failure situation; rapidly developing:**

1. Settlement of the crest, slopes, abutments and/or foundation of the dam that may eventually result in breaching of the dam.
2. Significant increase in length, width, or offset of cracks in the crest, slopes, abutments, and/or foundation of the dam that may eventually result in breaching of the dam.

### **Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

1. Sudden or rapidly proceeding slides, settlement, or cracking of the embankment crest, slopes, abutments, and/or foundation, and breaching of the dam appears imminent or is in progress.

### Step 3 Notifications and Communication

#### Notification

After the emergency level has been determined, the people on the following notification charts for the appropriate emergency level shall be notified immediately.

#### Communication

##### **Emergency Level 1—Nonemergency, unusual event; slowly developing:**

The Dam Owner or Operator should contact their Engineer and Oklahoma Water Resources Board. Describe the situation and request technical assistance on next steps to take.

##### **Emergency Level 2—Emergency event, potential dam failure situation; rapidly developing:**

The following message may be used to help describe the emergency situation to the name of law enforcement contact, organization, & title or name of emergency manager and title:

*“This is \_\_\_\_\_ (Identify yourself; name, position)\_\_\_\_\_.*

*We have an emergency condition at Name of Dam, located \_\_\_miles provide general location of dam.*

*We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 2.*

*We are implementing predetermined actions to respond to a rapidly developing situation that could result in dam failure.*

*Please prepare to evacuate the area along low-lying portions of Name of Stream.*

*Reference the Inundation map in your copy of the Emergency Action Plan.*

*We will advise you when the situation is resolved or if the situation gets worse.*

*I can be contacted at the following number \_\_\_\_\_ . If you cannot reach me, please call the following alternative number \_\_\_\_\_.”*

**Emergency Level 3—Urgent event; dam failure appears imminent or is in progress:**

The appropriate law enforcement agency and emergency management coordinator should be contacted immediately and the area evacuated. The following actions should be taken:

1. Call the law enforcement's dispatch center. Be sure to say, "This is an emergency." They will call other authorities and the media and begin the evacuation. The following message may be used to help describe the emergency situation to the *name of law enforcement contact, organization, & title or name of emergency manager and title*:

*"This is an emergency. This is Identify yourself; name, position.*

*Name of Dam, located \_\_\_ miles Provide General Location of Dam, is failing. The downstream area must be evacuated immediately. Repeat, Name of Dam, is failing; evacuate the area along low-lying portions of Name of Creek or Stream.*

*We have activated the Emergency Action Plan for this dam and are currently under Emergency Level 3. Reference the Inundation map in your copy of the Emergency Action Plan.*

*I can be contacted at the following number Telephone Number. If you cannot reach me, please call the following alternative number Telephone Number."*

2. Do whatever is necessary to bring people in immediate danger (anyone on the dam, downstream from the dam, boating on the reservoir, or evacuees) to safety if directed by the Sheriff.
3. Keep in frequent contact with the Sheriff and emergency services to keep them up-to-date on the condition of the dam. They will tell you how you can help handle the emergency.
4. If all means of communication are lost: (1) try to find out why, (2) try to get to another radio or telephone that works, or (3) get someone else to try to re-establish communications. If these means fail, handle the immediate problems as well as you can, and periodically try to re-establish contact with the Sheriff and emergency services.

The following prescribed message may be used as a guide for the *Law Enforcement Agency or Name of Emergency Services Entity* emergency services personnel to communicate the status of the emergency with the public:

*Attention: This is an emergency message from the Sheriff. Listen carefully. Your life may depend on immediate action.*

*Name of Dam, located \_\_\_ miles direction of Name of City, is failing. Repeat. Name of Dam, number of miles miles direction of Name of city, is failing.*

*If you are in or near this area, proceed immediately to high ground away from the valley. Do not travel on Name of Road Direction of Name of City or return to your home to recover your possessions. You cannot outrun or drive away from the flood wave. Proceed immediately to high ground away from the valley.*

Repeat message.

#### *Step 4*            *Expected Actions*

If the Police or Sheriff receives a 911 call regarding observations of an unusual or emergency event at the dam, they should immediately contact the Dam Owner or Operator. After the Dam Owner or Operator determines the emergency level, the following actions should be taken. If time permits the Oklahoma Water Resources Board Dam Safety Engineer should be contacted for technical consultation.

##### **Emergency Level 1—Nonemergency, unusual event; slowly developing:**

- A. The Dam Owner or Operator should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also, check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the Oklahoma Water Resources Board; refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.**
- B. Record all contacts that were made on the *Contact Checklist* (Appendix A – page 27). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A – page 28). Note the time of changing conditions. Document the situation with photographs and video, if possible.
- C. The Dam Owner or Operator should contact their Technical Representative to investigate the situation and recommend corrective actions.

##### **Emergency Level 2—Potential dam failure situation; rapidly developing:**

- A. The Dam Owner or Operator should contact their Engineer to report the situation and, if time permits, request they investigate the situation and recommend corrective actions, and if time permits to report the situation to the Oklahoma Water Resources Board.
- B. The Dam Owner should contact the Emergency Management Coordinator and appropriate law enforcement agency to inform them that the EAP has been activated and if current conditions get worse, an emergency situation may require evacuation. Preparations should be made for possible road closures and evacuations.
- C. Provide updates to the Sheriff or Police Department and emergency services personnel to assist them in making timely decisions concerning the need for warnings, road closures, and evacuations.
- D. If time permits, the Dam Owner or Operator should inspect the dam. At a minimum, inspect the full length of the upstream slope, crest, downstream toe, and downstream slope. Also, check the reservoir area, abutments, and downstream channel for signs of changing conditions. **If piping, increased seepage, erosion, cracking, or settlement are observed, immediately report the observed conditions to the Oklahoma Water Resources Board; refer to the emergency level table for guidance in determining the appropriate event level for the new condition and recommended actions.**
- E. Record all contacts that were made on the *Contact Checklist* (Appendix A – page 27). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A – page 28). Note the time of changing conditions. Document the situation with photographs and video, if possible.
- F. If time permits, the following emergency remedial actions should be taken as appropriate.

## **Emergency Level 2—Potential dam failure situation; rapidly developing—continued:**

### ***Emergency remedial actions***

If time permits, the following emergency remedial actions should be considered for Emergency Level 2 conditions. Immediate implementation of these remedial actions may delay, moderate, or prevent the failure of the dam. Several of the listed adverse or unusual conditions may be apparent at the dam at the same time, requiring implementation of several modes of remedial actions. Close monitoring of the dam must be maintained to confirm the success of any remedial action taken at the dam. Time permitting, any remedial action should be developed through consultation with their Engineer and the Oklahoma Water Resources Board. See *Resources Available* (Appendix B – page 34) for sources of equipment and materials to assist with remedial actions.

### ***Embankment overtopping***

1. If the water level in the reservoir is no longer rising, place sandbags along the low areas of the top of the dam to control wave action, reduce the likelihood of flow concentration during minor overtopping, and to safely direct more water through the spillway.
2. Cover the weak areas of the top of the dam and downstream slope with riprap, sandbags, plastic sheets, or other materials to provide erosion-resistant protection.

### ***Seepage and sinkholes***

1. Open the principal spillway gate to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a nonerosive velocity. If the gate is damaged or blocked, pumping or siphoning may be required.

Continue lowering the water level until the seepage stops.

2. If the entrance to the seepage origination point is observed in the reservoir (possible whirlpool) and is accessible, attempt to reduce the flow by plugging the entrance with readily available materials such as hay bales, bentonite, soil or rock fill, or plastic sheeting.
3. Cover the seepage exit area(s) with several feet of sand/gravel to hold fine-grained embankment or foundation materials in place. Alternatively, construct sandbag or other types of ring dikes around seepage exit areas to retain a pool of water, providing backpressure and reducing the erosive nature of the seepage.
4. Prevent vehicles and equipment from driving between the seepage exit points and the embankment to avoid potential loss from the collapse of an underground void.

### ***Embankment movement***

1. Open outlet(s) and lower the reservoir to a safe level at a rate commensurate with the urgency and severity of the condition of the slide or slump. If the gate is damaged or blocked, pumping or siphoning may be required.
2. Repair settlement of the crest by placing sandbags or earth and rock fill materials in the damaged area to restore freeboard.
3. Stabilize slides by placing a soil or rock fill buttress against the toe of the slide.

### ***Earthquake***

1. Immediately conduct a general overall visual inspection of the dam.
2. Perform a field survey to determine if there has been any settlement and movement of the dam embankment, spillway, and low-level outlet works.
3. Drain the reservoir, if required.

**Emergency Level 3—Urgent; dam failure appears imminent or is in progress:**

- A. The Dam Owner or Operator shall immediately contact the appropriate law enforcement office and others shown on the notification chart.
- B. The Police Department or Sheriff shall lead the efforts to carry out warnings, close roads, and evacuate people at risk downstream from the dam (see *Inundation Map* – Appendix B – page 36).
- C. Emergency management services personnel shall alert the public and immediately evacuate at-risk people and close roads as necessary.
- D. The Dam Owner or Operator shall maintain continuous communication and provide the Sheriff with updates of the situation to assist him/her in making timely decisions concerning warnings and evacuations.
- E. The Dam Owner or Operator should record all contacts that were made on the *Contact Checklist* (Appendix A – page 27). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A – page 28). Note the time of changing conditions. Document the situation with photographs and video, if possible.
- F. Advise people monitoring the dam to follow safe procedures. Everyone should stay away from any of the failing structures or slopes and out of the potential breach inundation areas.

## *Step 5 Termination*

Whenever the EAP has been activated, an emergency level has been declared, all EAP actions have been completed, and the emergency is over, the EAP operations must eventually be terminated and follow-up procedures completed.

### ***Termination responsibilities***

The Sheriff is responsible for terminating EAP operations and relaying this decision to the Dam Owner or Operator. It is then the responsibility of each person to notify the same group of contacts that were notified during the original event notification process to inform those people that the event has been terminated.

Prior to termination of an Emergency Level 3 event that has not caused actual dam failure, the dam owner's technical representative or the State Dam Safety Officer will inspect the dam or require the inspection of the dam to determine whether any damage has occurred that could potentially result in loss of life, injury, or property damage. If it is determined that conditions do not pose a threat to people or property, the Sheriff will be advised to terminate EAP operations as described above.

The Dam Owner or Operator shall assure that the *Dam Safety Emergency Situation Report* (Appendix A – page 29) is completed to document the emergency event and all actions that were taken. The Dam Owner shall distribute copies of the completed report to the Oklahoma Water Resources Board.

# **Maintenance—EAP Review and Revision**

## **EAP annual review**

The Dam Owner or Operator will review and, if needed, update the EAP at least once each year. The EAP annual review will include the following:

- Calling all contacts on the three notification charts in the EAP to verify that the phone numbers and persons in the specified positions are current. The EAP will be revised if any of the contacts have changed.
- Contacting the local law enforcement agency to verify the phone numbers and persons in the specified positions. In addition, the Dam Owner or Operator will ask if the person contacted knows where the EAP is kept and if responsibilities described in the EAP are understood.
- Calling the locally available resources to verify that the phone numbers, addresses, and services are current.

## **Revisions**

The Dam Owner is responsible for updating the EAP document. The EAP document held by the Dam Owner is the master document. When revisions occur, the Dam Owner will provide the revised pages and a revised revision summary page to all the EAP document holders. The document holders are responsible for revising outdated copy of the respective document(s) whenever revisions are received. Outdated pages shall be immediately discarded to avoid any confusion with the revisions.

## **EAP periodic test**

The Dam Owner should host and facilitate a periodic test of the EAP at least once every 5 years.

The periodic test will consist of a meeting, including a tabletop exercise. Attendance should include the Dam Owner or Operator, other personnel, at least one representative of the local law enforcement agency, and others with key responsibilities listed in the EAP. At the discretion of the Dam Owner, other organizations that may be involved with an unusual or emergency event at the dam are encouraged to participate. Before the tabletop exercise begins, meeting participants will visit the dam during the periodic test to familiarize themselves with the dam site.

The tabletop exercise will begin with the facilitator presenting a scenario of an unusual or emergency event at the dam. The scenario will be developed prior to the exercise. Once the scenario has been presented, the participants will discuss the responses and actions that they would take to address and resolve the scenario. The narrator will control the discussion, ensuring realistic responses and developing the scenario throughout the exercise. The Dam Owner or Operator should complete an event log as they would during an actual event.

After the tabletop exercise, the five sections of the EAP will be reviewed and discussed. Mutual aid agreements and other emergency procedures can be discussed. The Dam Owner should prepare a written summary of the periodic test and revise the EAP, as necessary.

# Appendices—Forms, Glossary, Maps, and Supporting Data

## Appendix A

Record of Revisions and Updates Made to EAP .....	26
Contact Checklist .....	27
Unusual or Emergency Event Log Form .....	28
Dam Emergency Situation Report Form .....	29
Glossary of Terms .....	30

## Appendix B

Resources Available .....	34
Location and Vicinity Maps .....	35
Inundation Map .....	36
Residents/Businesses/Highways at Risk .....	37
Reservoir Elevation-Area-Volume and Spillway Capacity Data .....	38
National Inventory of Dams (NID) Data .....	39
Plans and Drawings of Dam .....	40

# **Appendix A**

## **Forms and Glossary**

## Record of Revisions and Updates Made to EAP

<b>Revision Number</b>	<b>Date of EAP Update</b>	<b>Briefly describe information updated</b>	<b>EAP Updated By</b>

# Contact Checklist

Name of Dam \_\_\_\_\_

Name of County \_\_\_\_\_

County, Oklahoma \_\_\_\_\_

Date \_\_\_\_\_

The following contacts should be made immediately after the emergency level is determined (see pages 13–16 for guidance 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 who was notified for each contact made. See the *Notification Charts* on pages 5-7 for critical contact information and *Emer. Services Contacts* on page 8 for contact information for other possible emergency services.

Emergency Level 1 (see page 5)	Person Contacted	Time Contacted	Contacted by
___ Dam Owner or Operator	_____	_____	_____
___ Engineer	_____	_____	_____
___ Oklahoma Water Resources Board	_____	_____	_____

Emergency Level 2 (see page 6)	Person Contacted	Time Contacted	Contacted by
___ Dam Owner or Operator	_____	_____	_____
___ Engineer	_____	_____	_____
___ Oklahoma Water Resources Board	_____	_____	_____
___ Sheriff	_____	_____	_____

Emergency Level 3 (see page 7)	Person Contacted	Time Contacted	Contacted by
___ Sheriff	_____	_____	_____
___ Oklahoma Water Resources Board	_____	_____	_____
___ Dam Owner or Operator	_____	_____	_____
___ Engineer	_____	_____	_____

# Unusual or Emergency Event Log

(to be completed during the emergency)

Dam name: Name of Dam

County: Name of County

When and how was the event detected?

\_\_\_\_\_

Weather conditions: \_\_\_\_\_

General description of the emergency situation:

\_\_\_\_\_

Emergency level determination: \_\_\_\_\_ Made by: \_\_\_\_\_

## Actions and Event Progression

Date	Time	Action/event progression	Taken by

Report prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

# Dam Emergency Situation Report

(to be completed following the termination of the emergency)

Dam name: \_\_\_\_\_

National Inventory of Dams (NID) No.: OK \_\_\_\_\_ County

Legal Location of Dam: \_\_\_\_\_

Name of Stream: \_\_\_\_\_ Nearest Downstream City: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Weather conditions: \_\_\_\_\_

General description of emergency situation:

\_\_\_\_\_  
\_\_\_\_\_

Area(s) of dam affected:

\_\_\_\_\_  
\_\_\_\_\_

Extent of dam damage: \_\_\_\_\_

Possible cause(s): \_\_\_\_\_

Effect on dam's operation: \_\_\_\_\_

Initial reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Maximum reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Final reservoir elevation: \_\_\_\_\_ Time: \_\_\_\_\_

Description of area flooded downstream/damages/injuries/loss of life: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Other data and comments:

\_\_\_\_\_

Observer's name and telephone number: \_\_\_\_\_

Report prepared by: \_\_\_\_\_ Date: \_\_\_\_\_

## Glossary of Terms

<b>Abutment</b>	That part of the valley side against which the dam is constructed. The left and right abutments of dams are defined with the observer looking downstream from the dam.
<b>Acre-foot</b>	A unit of volumetric measure that would cover 1 acre to a depth of 1 foot. One acre-foot is equal to 43,560 cubic feet or 325,850 gallons.
<b>Berm</b>	A nearly horizontal step (bench) in the upstream or downstream sloping face of the dam.
<b>Boil</b>	A disruption of the soil surface due to water discharging from below the surface. Eroded soil may be deposited in the form of a ring (miniature volcano) around the disruption.
<b>Breach</b>	An opening through the dam that allows draining of the reservoir. A controlled breach is an intentionally constructed opening. An uncontrolled breach is an unintended failure of the dam.
<b>Conduit</b>	A closed channel (round pipe or rectangular box) that conveys water through, around, or under the dam.
<b>Control section</b>	A usually level segment in the profile of an open channel spillway above which water in the reservoir discharges through the spillway.
<b>Cross section</b>	A slice through the dam showing elevation vertically and direction of natural water flow horizontally from left to right. Also, a slice through a spillway showing elevation vertically and left and right sides of the spillway looking downstream.
<b>Dam</b>	An artificial barrier generally constructed across a watercourse for the purpose of impounding or diverting water.
<b>Dam failure</b>	The uncontrolled release of a dam's impounded water.
<b>Dam Operator</b>	The person(s) or unit(s) of government with responsibility for the operation and maintenance of dam.
<b>Drain, toe or foundation, or blanket</b>	A water collection system of sand and gravel and typically pipes along the downstream portion of the dam to collect seepage and convey it to a safe outlet.
<b>Drainage area (watershed)</b>	The geographic area on which rainfall flows into the dam.
<b>Drawdown</b>	The lowering or releasing of the water level in a reservoir over time or the volume lowered or released over a particular period of time.
<b>Emergency</b>	A condition that develops unexpectedly, endangers the structural integrity of the dam and/or downstream human life and property, and requires immediate action.
<b>Emergency Action Plan</b>	A formal document identifying potential emergency conditions that may

<b>(EAP)</b>	occur at the dam and specifying preplanned actions to minimize potential failure of the dam or minimize failure consequences including loss of life, property damage, and environmental impacts.
<b>Evacuation map</b>	A map showing the geographic area downstream of a dam that should be evacuated if it is threatened to be flooded by a breach of the dam or other large discharge.
<b>Filter</b>	The layers of sand and gravel in a drain that allow seepage through an embankment to discharge into the drain without eroding the embankment soil.
<b>Freeboard</b>	The vertical distance between a stated water level in the reservoir and the top of dam.
<b>Gate, slide or sluice, or regulating</b>	An operable, watertight valve to manage the discharge of water from the dam.
<b>Groin</b>	The area along the intersection of the face of a dam and the abutment.
<b>Hazard classification</b>	A classification system that categorizes dams (high, significant, or low) according to the degree of their potential to create adverse incremental consequences such as loss of life, property damage, or environmental impacts of a failure or poor operation of a dam.
<b>Height of dam</b>	The vertical distance between the lowest point along the top of the dam and the lowest point at the downstream toe, which usually occurs in the bed of the outlet channel.
<b>Hydrograph</b>	A hydrograph is a graphical representation of the inflow or outflow of either the flow rate or flow depth at a specific point above or below the dam over time for a specific flood occurrence.
<b>Incident Commander</b>	The highest predetermined official available at the scene of an emergency situation.
<b>Instrumentation</b>	An arrangement of devices installed into or near dams that provide measurements to evaluate the structural behavior and other performance parameters of the dam and appurtenant structures.
<b>Inundation area or map</b>	The geographic area downstream of the dam that would be flooded by a breach of the dam or other large discharge.
<b>Notification</b>	To immediately inform appropriate individuals, organizations, or agencies about a potentially emergency situation so they can initiate appropriate actions.
<b>Outlet works (principal spillway)</b>	An appurtenant structure that provides for controlled passage of normal water flows through the dam.
<b>Piping</b>	The progressive destruction of an embankment or embankment foundation by internal erosion of the soil by seepage flows.
<b>Probable Maximum Precipitation (PMP) or Flood (PMF)</b>	The theoretically greatest precipitation or resulting flood that is meteorologically feasible for a given duration over a specific drainage area at a particular geographical location.

<b>Reservoir</b>	The body of water impounded or potentially impounded by the dam.
<b>Riprap</b>	A layer of large rock, precast blocks, bags of cement, or other suitable material, generally placed on an embankment or along a watercourse as protection against wave action, erosion, or scour.
<b>Risk</b>	A measure of the likelihood and severity of an adverse consequence.
<b>Seepage</b>	The natural movement of water through the embankment, foundation, or abutments of the dam.
<b>Slide</b>	The movement of a mass of earth down a slope on the embankment or abutment of the dam.
<b>Spillway (auxiliary or emergency)</b>	The appurtenant structure that provides the controlled conveyance of excess water through, over, or around the dam.
<b>Spillway capacity</b>	The maximum discharge the spillway can safely convey with the reservoir at the maximum design elevation.
<b>Spillway crest</b>	The lowest level at which reservoir water can flow into the spillway.
<b>Tailwater</b>	The body of water immediately downstream of the embankment at a specific point in time.
<b>Toe of dam</b>	The junction of the upstream or downstream face of an embankment with the ground surface.
<b>Top of dam (crest of dam)</b>	The elevation of the uppermost surface of an embankment which can safely impound water behind the dam.

# Appendix B

## Maps and Supporting Data



## **Location and Vicinity Maps**

# Inundation Map

## Residents/Businesses/Highways at Risk

A major flood caused by a sudden breach of the dam is estimated to inundate number of homes homes, number of businesses businesses, and number of highways or roads highways. These homes and businesses (marked on the inundation map – Appendix B-3) are located .

House/ business no.*	Resident/business	Address	Phone no.	Distance downstream from dam (ft)	Travel time** (hr)	Max water depth above first floor (ft)
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						

\* See Appendix B-3.

\*\* Estimated time for breach wave (peak) to travel from dam to downstream locations

### Basis for computation of evacuation area and flooding depths

Breach inundation study completed by Name of company who conducted breach analysis–date of analysis

Hydraulic model used: \_\_\_\_\_

Model assumptions: \_\_\_\_\_

- “Sunny Day” Breach (no inflow into the reservoir)
- Water surface elevation in reservoir prior to breach = \_\_\_\_\_ (top of dam)
- Total volume of breach hydrograph = \_\_\_\_\_ acre-ft
- Height of water at time of breach = \_\_\_\_\_ ft
- Peak breach discharge = \_\_\_\_\_ ft<sup>3</sup>/s
- Downstream area defined by field surveys consisting of 10 cross sections and 3 bridge openings

# Reservoir Elevation-area-volume and Spillway Capacity Data

Name of Dam

Elevation	Reservoir Surface (acres)	Reservoir Storage (acre-feet)	Spillway Discharge (t <sup>3</sup> /s)
Principle Spillway Crest			
Auxiliary Spillway Crest			

# National Inventory of Dams (NID) Data

Dam name: \_\_\_\_\_

Dam Owner: \_\_\_\_\_

State: **Oklahoma**

NID ID: **OK**\_\_\_\_\_

Longitude: \_\_\_\_\_

Latitude: \_\_\_\_\_

Legal Location: \_\_\_\_\_

County: \_\_\_\_\_

Stream System: \_\_\_\_\_

HUC: \_\_\_\_\_

Stream: \_\_\_\_\_

Nearest downstream town: \_\_\_\_\_

Distance to nearest town: \_\_\_\_\_ **mi**

Year dam constructed: \_\_\_\_\_

Inspection frequency: **Every year**

State regulated? **Yes**

State regulatory agency: **OWRB**

Inspection Engineer: \_\_\_\_\_

Date of Last inspection: \_\_\_\_\_

Design hazard-potential: \_\_\_\_\_

Current hazard-potential: **High**

Breach analysis: \_\_\_\_\_

Inundation map: \_\_\_\_\_

Drainage area: \_\_\_\_\_ **mi<sup>2</sup>**

Dam height: \_\_\_\_\_ **ft.**

Dam length: \_\_\_\_\_ **ft.**

Elev. Crest of Dam: \_\_\_\_\_ **ft (msl)**

Principal spillway outlet gates: \_\_\_\_\_

Principal spillway width: \_\_\_\_\_ **ft.**

Elev. of principal spillway: \_\_\_\_\_ **ft. (msl)**

Emergency spillway width: \_\_\_\_\_ **ft.**

Elev. of Crest of Emergency Spillway: \_\_\_\_\_ **ft. (msl)**

Maximum storage surface area: \_\_\_\_\_ **acres**

Maximum storage: \_\_\_\_\_ **acre-ft**

Normal storage surface area: \_\_\_\_\_ **acres**

Normal storage: \_\_\_\_\_ **acre-ft**

Elev. of Valley Floor Drain: \_\_\_\_\_ **ft. (msl)**

Maximum discharge: \_\_\_\_\_ **ft<sup>3</sup>/s**

# **Plans and Drawings of Dam**