**Emergency Action Plan (EAP)**

**Dam Name, MD Dam No. ###**

**(LAKE/POND NAME)**

**National Inventory of Dams (NID) No. MD00###**

**County Name, Maryland**

****

Insert local area map showing specific location of dam

**LOCATION OF DAM**

Reviewed and Updated:

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

*Owner Representative Name, Title, Owner Entity Name Maryland Dam Safety*

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
 *Date Date*

Copy of .

**Table of Contents**

Basic EAP Data 3

EAP Overview 5

Roles and Responsibilities 6

The Five-step EAP Process

Step 1 Event Detection 8

Step 2 Emergency Level Determination 8

Guidance for Determining the Emergency Level 10

Emergency Situations 11

Step 3 Notification and Communication 14

Notification Charts 17

Emergency Services & Other Contacts 20

Step 4 Expected Actions 21

Step 5 Termination 24

Maintenance—EAP Review and Revision 25

Record of Holders of Control Copies of this EAP 26

Record of Revisions and Updates Made to EAP 27

Appendices—Forms, Glossary, Maps, and Supporting Data 28

Appendix A

Appendix A–1 Contact Checklist 29

Appendix A–2 Unusual or Emergency Event Log Form 30

Appendix A–3 Dam Emergency Situation Report Form 31

Appendix A–4 Glossary of Terms 32

Appendix B

Appendix B–1 Resources Available 35

Appendix B–2 Location and Vicinity Maps 36

Appendix B–3 Watershed Project Map 37

Appendix B–4 Inundation Map 38

Appendix B–5 Residents/Businesses/Highways at Risk 39

Appendix B-6 Flood Summary Table 40

Appendix B-7 Residents/Businesses/Highways at Risk for High Flow Events 41

Appendix B–8 Plan View of Dam 42

Appendix B–9 Profile of Principal Spillway 43

Appendix B–10 Reservoir Elevation-Area-Volume and Spillway Capacity Data 44

Appendix B–11 National Inventory of Dams (NID) Data 45

# 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 Dam Name, MD Dam No. ###. It defines responsibilities and procedures to identify conditions that might endanger the dam, notify appropriate emergency personnel, and take possible mitigating actions.

###### Potential Impacted Area

See *Inundation 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:

*(Describe homes, businesses, schools, emergency services and roads in downstream evacuation area)*

**Dam Description**

Height: ## ft Drainage Area: ### sq. miBuilt: YYYY Hazard Classification: High, Significant, Low  
Dam Operator: OPERATOR NAME Major Property Owner: Name or Company  
Latitude: ##.##### Longitude: -##.##### Dam Designer: Company Name  
National Inventory of Dams No.: MD00###

See detailed design data in *Appendix B* tab.

**Pre-existing conditions at this dam:** Indicate pre-existing conditions (e.g., seepage, concrete deterioration) that may impact the dam in an unusual event. These conditions are typically noted during MDE Dam Safety Inspections. *Example:* 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 1990’s, but has not changed since that time.

**Directions to dam** (See *Location and Vicinity Map*; Appendix B–2.)

Provide directions from nearest large city or town. Indicate distances and road names. If possible, avoid roads that are within dam breach inundation area. Also provide information necessary to access dam (e.g. Keys for the lock on the gate are available from the County Engineer at 523 Second Street, Rock City, MD.) *Example:* The primary route to the dam from Exist 15 on I-22 westbound. Take a left off of the exit onto Route 43. Travel for 3 miles, then take a right onto Main Street (Route 101). Follow this road for 0.5 miles, then take the right fork to continue north. The Dam is located 0.2 miles past the fork on the right.

Provide an alternate route where possible. *Example:* An alternate route to the dam is available approximately 0.5 miles south of Rock Creek on Highway 44; turn right on an ungated dirt road that goes to the right abutment of the dam. Note that Highway 44 may be inundated or the bridge may be damaged, so access to this alternate route may have to be gained from Highway 44 south of the dam.

**Emergency Recognition and Response During Periods of Darkness:** Provide a description of anticipated actions, equipment, supplies that would assist identifying a dam emergency or respond to a dam emergency during a period of darkness.

**Emergency Recognition and Response During Weekends and Holidays:** Provide a description of anticipated actions, equipment, supplies that would assist identifying a dam emergency or respond to a dam emergency during periods when personnel availability may be limited.

**Emergency Recognition and Response During Periods of Adverse Weather:** Provide a description of anticipated actions, equipment, supplies that would assist identifying a dam emergency or respond to a dam emergency during periods of adverse weather. How might adverse weather hinder access to dam components.

# EAP Overview

# 

# Roles and Responsibilities

**Dam Owner’s Representative (Dam Inspector or Operator Name)**

* As soon as an emergency event is observed or reported, immediately determine the emergency level (see *Emergency Levels* tab).
  + High Flow Event: Flooding of downstream people or infrastructure possible. No indications of dam distress
  + Non-Failure Emergency (Level 1): Unusual event, slowly developing
  + Potential Failure Emergency (Level 2): Potential dam failure situation, rapidly developing
  + Imminent Failure Emergency (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* tab).
* Provide updates of the situation to the incident commander to assist them in making timely and accurate decisions regarding warnings and evacuations.
* Keep in contact with incident commander, public information officer, technical representatives, and State dam safety agency to communicate current conditions. Take corrective actions and respond to emergencies throughout the event.
* 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.

**Incident Commander (Office of Emergency Management)**

(Note: In accordance with the National Incident Management System (NIMS), a Unified Command may be established on the scene but outside of the flood threat area in lieu of an Incident Command. Unified Command is a management system in which the Command members from the different stake holding agencies (i.e. Police, Fire, Local DPW, etc.) make collective decisions on the response and management activities of the incident (i.e. evacuation, road closure, sheltering, etc.)

* Serve as the primary contact responsible for coordination of all emergency actions.
* When a High Flow Event of Potential Failure Emergency (Level 2) situation occurs, Prepare emergency management personnel and the downstream population at risk for possible evacuations that may be needed.
* When an Imminent Failure( Level 3) situation occurs:
  + Initiate warnings and order evacuation of people at risk downstream of the dam.
  + Carry out the evacuation of people and close roads within the evacuation area (see Inundation Map tab).
* Decide when to terminate the emergency in consultation with qualified dam engineering personnel from the State Dam Safety agency.
* Participate in an annual review and update of the EAP.

**Emergency Management Services (Police & Fire Department)**

* Maintain communication with media.
* Prepare evacuation plans and procedures prior to the incident.
* When a High Flow or Potential Failure (Level 2) situation occurs:
  + Prepare emergency management personnel for possible evacuations that may be needed if an Imminent Failure (Level 3) situation occurs.
  + Alert the public as appropriate.
* When a High Flow or Imminent Failure (Level 3) situation occurs:
  + Alert the public.
  + Immediately close roads and evacuate people in the evacuation area (see Inundation Map tab).
* Participate in an annual review and update of the EAP.

**Dam Operator’s Technical Representatives or Engineer**

* Advise the Dam Operator of the emergency level determination, if time permits.
* Advise the Dam Operator of remedial actions to take if Potential Failure (Level 2) event occurs, if time permits.
* Participate in an annual review and update of the EAP.

**Maryland Dam Safety**

* Provide assistance in determining the emergency level, if time permits.
* Provide advice of remedial actions to be taken, if time permits.
* Provide advice when to terminate the Emergency Action Plan.
* Participate in an annual review and update of the EAP.

# 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. Early detection of unusual events and evaluation of the condition of the dam is crucial.

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 Observer or his alternate is responsible for classifying the event into one of the following three emergency levels:

### High Flow Emergency Level—No dam failure expected, but flooding of downstream people or infrastructure possible:

This situation indicates that the spillway or low-level outlet works is operating as intended with a large discharge that may cause flooding of downstream roads, homes, businesses, or other infrastructure, but there is no apparent threat to the integrity of the dam. The county sheriff should be informed if it is determined that the auxiliary flow depth is approaching a predetermined safe channel discharge capacity that could threaten downstream areas so that appropriate warnings, road closures, or evacuation actions can be taken. For dams that have no downstream impacts from the spillway or outlet works releases, this emergency level will not be necessary.

### Non-Failure 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. The Dam Owners technical representatives and 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 County Office of Emergency Management should be informed if it is determined that the conditions may possibly develop into a worse condition that may require emergency actions.

### Potential Failure 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 County Office of Emergency Management should be notified of this emergency situation and be advised to “prepare to evacuate.” This would include issuing a dam failure watch to the population at-risk downstream. The Dam Operator should closely monitor the condition of the dam and periodically report the status of the situation to the County Office of Emergency Management. If the dam condition worsens and failure becomes imminent, the County Office of Emergency Management must be notified immediately of the change in the emergency level to evacuate the people at risk downstream.

If time permits, the Dam Owners engineer 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.

### Imminent Failure Emergency (Level 3)—Urgent; dam failure appears imminent or is in progress:

This is an extremely urgent situation when dam failure is occurring or about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. The County Office of Emergency Management should be contacted immediately so emergency services can begin evacuations of all at-risk people and close roads as needed (see Inundation Map tab).

**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\*** |
| Spillways | Principal spillway severely blocked with debris or structurally damaged | Potential (2) |
| Principal spillway leaking with muddy flows | Potential (2) |
| Emergency spillway severely blocked with debris, soil, or trees | Potential (2) |
| Reservoir water surface elevation at auxiliary spillway crest or spillway is flowing with no active erosion | High Flow |
| Earth spillway flowing with active gully erosion | Potential (2) |
| Earth spillway flowing with an advancing head cut that is threatening the control section | Imminent (3) |
| Flooding / Elevated Pool Levels | National Weather Service issues a flood warning for the area | High Flow |
| The reservoir elevation reaches the predetermined notification trigger elevation ###.# NGVD (Describe a permanent physical reference point associated with trigger elevation) | Potential (2) |
| The reservoir elevation reaches the predetermined evacuation trigger elevation ###.# NGVD (Describe a permanent physical reference point associated with trigger elevation) | Imminent (3) |
| Dam discharges are approaching or exceeding the safe channel capacity causing flooding of roads and people downstream | High Flow |
| Embankment overtopping | Water is flowing over the top of the dam with no erosion occurring | Potential (2) |
| Water from the reservoir is flowing over the top of the dam with erosion observed | Imminent (3) |
| Seepage | New seepage areas in or near the dam | Non-Failure (1) |
| Boils observed downstream of dam | Non-Failure (1) |
| Boils observed downstream of dam with cloudy discharge | Potential (2) |
| New seepage areas with cloudy discharge or increasing flow rate | Potential (2) |
| Seepage with discharge greater than 10 gallons per minute | Imminent (3) |
| Sinkholes | Observation of new sinkhole in reservoir area (vortex) or on embankment | Potential (2) |
| Rapidly enlarging sinkhole | Imminent (3) |
| Embankment Cracking | New cracks in the embankment greater than 1/4-inch wide without seepage | Non-Failure (1) |
| Cracks in the embankment with seepage | Potential (2) |
| Embankment Movement | Visual movement/slippage of the embankment slope | Non-Failure (1) |
| Sudden or rapidly proceeding slides of the embankment slopes | Imminent (3) |
| Instruments | Instrumentation readings beyond predetermined/normal range of values | Non-Failure (1) |
| Earthquake | Measurable earthquake felt or reported on or within 50 miles of the dam | Non-Failure (1) |
| Earthquake resulting in visible damage to the dam or appurtenances | Potential (2) |
| Earthquake resulting in uncontrolled release of water from the dam | Imminent (3) |
| Security Threat | Verified bomb threat that, if carried out, could result in damage to the dam | Potential (2) |
| Damage to dam or appurtenances with no impacts to the functioning of the dam | Potential (2) |
| Detonated bomb that has resulted in damage to the dam or appurtenances | Imminent (3) |
| Sabotage / Vandalism | Damage to dam or appurtenances with no impacts to the functioning of the dam | Non-Failure (1) |
| Modification to the dam or appurtenances that could adversely impact the functioning of the dam | Non-Failure (1) |
| Damage to dam or appurtenances that has resulted in seepage flow | Potential (2) |
| Damage to dam or appurtenances that has resulted in uncontrolled water release | Imminent (3) |

\* High Flow Emergency Level: No dam failure expected, downstream flooding possible

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

Potential Failure Emergency (Level 2): Potential dam failure situation, rapidly developing

Imminent Failure Emergency (Level 3): Urgent; dam failure appears to be imminent or is in progress.

## 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 components, design and construction oversights, or extreme weather events that exceed designed conditions and can cause significant flow through the spillways or overtopping of the embankment. 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.

**SPLILLWAY FLOWS**

**Earth or Structural Spillway Flows**

**High Flow Emergency Level—Flooding of downstream people or infrastructure possible:**

1. Flow through the spillways currently exceed or will likely exceed the safe downstream channel capacity that may cause flooding that could threaten people, homes, and/or roads downstream from the dam (not applicable to all dams).

**Earth Spillway Flows**

**Potential Failure Emergency (Level 2) - Potential dam failure situation; rapidly developing:**

1. Significant erosion or head cutting of the earth spillway is in process, 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.

**Imminent Failure Emergency (Level 3) - Urgent; dam failure is imminent or is in progress:**

1. Significant erosion or head cutting of the earth spillway is occurring at a rapid rate, and a breach of the control section appears imminent

**FLOODING**

**Non-Failure Emergency (Level 1) – Flood Warning issued by National Weather Service**

1. Flooding is expected to occur in low-lying areas that triggers surveillance of the dam, or predicted rainfall is to exceed 5 inches in 24 hours, 4 inches in 12 hours, or 3 inches in 6 hours.

**Potential Failure Emergency (Level 2) - Potential Dam Failure Situation; Rapidly Developing**

1. The reservoir elevation has reached the predetermined trigger elevation of ###.# (Indicate physical reference point) that requires Emergency Level 2 notification.
2. Flow through the spillways is expected to cause flooding that could threaten people, homes, and/or roads downstream from the dam.

**Imminent Failure Emergency (Level 3) – Urgent; Severe Flooding is occurring to roads, houses and loss of life is probable**

1. The reservoir elevation has reached the predetermined trigger elevation of ###.# (Indicate physical reference point) that requires Emergency Level 3 notification
2. Significant flooding is occurring to downstream roads, houses, buildings, and people are at risk of flood dangers from spillway flows.

**EMBANKMENT OVERTOPPING**

**Potential Failure Emergency (Level 2) - Potential dam failure situation; rapidly developing:**

1. Water is flowing over the top of the dam, but no observed erosion.

**Imminent Failure Emergency (Level 3) - Urgent; dam failure appears to be imminent or is in progress:**

1. Water is flowing over the embankment, with observed erosion of the embankment slope

**SEEPAGE AND SINKHOLES**

**Potential Failure 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.

**Imminent Failure Emergency (Level 3)– Urgent; Dam Failure Appears to be 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**

**Potential Failure Emergency (Level 2)- Potential Dam Failure Situation; Rapidly Developing**

1. Settlement of the crest, slopes, abutments and/or foundation of the dam, which 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.

**Imminent Failure Emergency (Level 3)– Urgent; Dam Failure Appears to be 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 Notification and Communication

### Notification

After the emergency level has been determined, the people on the following notification charts for the appropriate emergency level must be notified immediately. Communications are typically by phone; however, Twitter, Facebook, radio, email, or other means of communication may be used.

### Communication

It is important to speak in clear and nontechnical terms to ensure those being notified understand what is happening, what the emergency level is, and what action to take.

### Non-Failure Emergency (Level 1) —Nonemergency, unusual event; slowly developing OR

**High Flow Emergency Level – Flooding of downstream people or infrastructure possible**

The Dam Owner or Operator should contact their designated engineer and the Maryland Dam Safety Division. Describe the situation, and request technical assistance on next steps to take. A courtesy call to the county sheriff or emergency manager may be made to enhance situational awareness. Describe the situation including the estimated depth of flow and request technical assistance on next steps to take. If flooding of downstream people or property is imminent, notify entities on notification chart and explain that the dam is not failing but describe the specific properties that might be in danger.

### Potential Failure 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 County Office of Emergency Management or County Name emergency management personnel:

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

*We have an emergency condition at Dam Name, MD Dam No. ###, located # miles Indicate direction of Indicate nearest City/Town downstream of dam.*

*We have activated the Emergency Action Plan for this dam and are currently under Potential Failure 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 (Indicate name of stream or valley downstream of dam).*

*Reference the evacuation 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 (Phone Number). If you cannot reach me, please call the following alternative number (Phone Number).”*

**Imminent Failure Emergency (Level 3)—Urgent event dam failure appears imminent or is in progress, or severe flooding is occurring:**

The County Office of Emergency Management should be contacted immediately and the area evacuated (see *Inundation Map* tab). The following actions should be taken:

1. Call the County Office of Emergency Management’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 County Office of Emergency Management:

*“This is an emergency. This is \_\_\_\_\_(Identify yourself; name and position) \_\_\_\_\_\_\_\_\_.*

*Dam Name, MD Dam No. ###, located # miles Indicate direction of Indicate nearest City/Town downstream of dam is failing. The downstream area must be evacuated immediately. Repeat, Dam Name, MD Dam No. ###, is failing; evacuate the area along low-lying portions of (Indicate name of stream or valley downstream of dam).*

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

*I can be contacted at the following number (Phone Number). If you cannot reach me, please call the following alternative number (Phone Number).”*

1. 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 County Office of Emergency Management.
2. Keep in frequent contact with the County Office of Emergency Management 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.
3. 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 County Office of Emergency Management and emergency services.

The following prescripted message may be used as a guide for the County Office of Emergency Management or emergency services personnel to communicate the status of the emergency with the public:

*Attention: This is an emergency message from the County Office of Emergency Management. Listen carefully. Your life may depend on immediate action.*

*Dam Name, MD Dam No. ###, located # miles Indicate direction of Indicate nearest City/Town downstream of dam, is failing. Repeat. Name, MD Dam No. ###, located # miles Indicate direction of Indicate nearest City/Town downstream of dam, is failing.*

*If you are in or near this area, proceed immediately to high ground away from the valley. Do not travel on Indicate names of roads that may be flooded Indicate direction of Indicate nearest City/Town downstream of dam 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.

# Non-Failure Emergency (Level 1) Notifications

**Non-Emergency, Unusual Event; Slowly Developing**

**MARYLAND DAM SAFETY OFFICIAL**

First Name Last Name

Regional Engineer

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

MDE After Hour Emergencies

1-866-633-4686

**Dam Inspectors**

Inspector Agency Alternate Inspector Agency

First Name Last Name Alternate First Name Last Name

410-555-XXXX (Office) 410-555-XXXX (Office) 410-555-XXXX (Cell) 410-555-XXXX (Cell)

410-555-XXXX (Home) 410-555-XXXX (Home)

**Dam Operator’s Engineer**

First Name Last Name,

Company Name

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

See *Emer. Services Contacts* tab for contact

information for back-ups to the persons shown above

and other emergency personnel.

**Note:**

1, 2, etc., denotes call sequence

**Legend:**

Calls by Operator \_\_\_\_\_\_

Second level calls - - - - -

(1)

(2)

# Potential Failure Emergency (Level 2) Notifications

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

**Note: Also to be used for High Flow Emergency Level**

Local News Media Outlet:

Contact Name

Channel/Frequency

410-555-XXXX

**MARYLAND DAM SAFETY OFFICIAL**

First Name Last Name

Regional Engineer

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

MDE After Hour Emergencies

1-866-633-4686

**Dam Inspectors**

Inspector Agency Alternate Inspector Agency

First Name Last Name Alternate First Name Last Name

410-555-XXXX (Office) 410-555-XXXX (Office) 410-555-XXXX (Cell) 410-555-XXXX (Cell)

410-555-XXXX (Home) 410-555-XXXX (Home)

**Incident Commander**

County Office of Emergency Management

Call 911

410-555-XXXX (Office)

**Dam Operator’s Engineer**

First Name Last Name,

Company Name

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

County Name Emergency

Management Dispatcher

410-555-XXXX

See *Communications* tab for prescripted messages.

National Weather Service

410-555-XXXX

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

(3)

(2)

(1)

MD State Police

Dispatcher

410-555-XXXX

**Note:**

1, 2, etc., denotes call sequence

**Legend:**

Calls by Operator \_\_\_\_\_\_\_

Second level calls - - - - - -

County Name

Police Dispatcher

410-555-XXXX

# Imminent Failure Emergency (Level 3) Notifications

**Urgent Event, Dam Failure Appears Imminent or is in Progress**

MD State Police

Dispatcher

410-555-XXXX

County Name Police

Dispatcher

410-555-XXXX

National Weather Service

410-555-XXXX

**MARYLAND DAM SAFETY OFFICIAL**

First Name Last Name

Regional Engineer

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

MDE After Hour Emergencies

1-866-633-4686

Local News Media Outlet:

Contact Name

Channel/Frequency

410-555-XXXX

See *Communications* tab

for prescripted messages.

**Dam Inspectors**

Inspector Agency Alternate Inspector Agency

First Name Last Name Alternate First Name Last Name

410-555-XXXX (Office) 410-555-XXXX (Office) 410-555-XXXX (Cell) 410-555-XXXX (Cell)

410-555-XXXX (Home) 410-555-XXXX (Home)

County Name

Emergency Management

Dispatcher

410-555-XXXX

Dam Operator’s Engineer

First Name Last Name,

Company Name

410-555-XXXX (Office)

410-555-XXXX (Cell)

410-555-XXXX (Home)

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

**Note:**

1, 2, etc., denotes call sequence

**Legend**

Calls by Operator \_\_\_\_\_\_\_

Second level calls - - - - -

**Incident Commander**

County Office of Emergency Management

Call 911 or

410-555-XXXX (Office)

(3)

(2)

(1)

### Emergency Services & Other Contacts

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Agency / Organization** | **Principal Contact**  **& Email Address** | **Address** | **Office telephone number** | **Alternate telephone numbers** |
|  |  |  |  |  |
| County Name  Road Department / DPW | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| County Name  Director of Emergency Management | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| County Name TV Station (Channel) | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| Landowner of Dam No. ### | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| National Weather Service | Decision Support Meteorologist  nws-sterling-wxsupport@noaa.gov |  | 1-800-253-7091 (24/7) | 1-703-996-2234 (Business Hours) |
| Maryland State Highway Administration | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| Maryland State Police  District # Office | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| MDE - Dam Safety Division Regional Engineer | First Name Last Name email@email.com Regional Engineer | 1800 Washington Blvd., Baltimore MD 21230 | 410-555-XXX  MDE After Hours Emergency  1-866-633-4686 | 410-555-XXXX |
| MDE - Dam Safety Division Chief | First Name Last Name email@email.com Chief of Dam Safety | 1800 Washington Blvd., Baltimore MD 21230 | 410-555-XXXX | 410-555-XXX |
| County Name Emergency Management Coordinator | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| County Name Fire Department | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| County Name Police | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
| County Name Radio Station (Frequency) | First Name Last Name email@email.com | Number Street  City, State | 410-555-XXXX | 410-555-XXXX |
|  |  |  |  |  |
|  |  |  |  |  |

## Step 4 Expected Actions

If the Police or emergency management staff receive a 911 call regarding observations of an unusual or emergency event at the dam, they should immediately contact the Dam Owner, Operator and/or the dam inspectors. After the Dam Owner and Operator determine the emergency level, and the initial notifications have been made, actions can many times be taken to minimize impacts to life and property. During this step, there is a continuous process of taking actions, assessing the status of the situation and keeping others informed through communication channels established during the initial notifications. The following are actions that should be taken for the situations shown. If time permits the technical representative and the Maryland Dam Safety Division should be contacted for technical consultation.

**High Flow Emergency Level—Flooding of downstream people or infrastructure possible:**

A. The Dam Owner and/or Operator should inspect the dam and estimate the depth of auxiliary spillway flow. If the flow depth is approaching the predetermined depth that may threaten downstream areas (see appendix B-6) and rain continues to fall, the Dam Owner and/or Operator should contact their engineer and request technical staff to recommend actions to take.

B. Record all contacts that were made on the Contact Checklist (appendix A–1). Record all information, observations, and actions taken on the Event Log Form (appendix A–2). Note the time of changing conditions. Document the situation with photographs and video, if possible.

**Non-Failure Emergency (Level 1): Non-emergency, Unusual Event; Slowly Developing:**

1. The Dam Owner or Operator, and technical representative 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 STATE DAM SAFETY OFFICE; REFER TO THE EMERGENCY LEVEL TABLE FOR GUIDANCE IN DETERMINING THE APPROPRIATE EVENT LEVEL FOR THE NEW CONDITION AND RECOMMENDED ACTIONS.
2. Record all of the contacts that were made on the *Contact Checklist* (Appendix A-1). Record all information, observations, and actions taken on the *Event Log Form* (Appendix A-2). Note the time of changing conditions. Document the situation with photographs and video if possible.
3. The Dam Owner or Operator should contact the State Dam Safety Office, and request technical staff to investigate the situation and recommend corrective actions.

**Potential Failure Emergency (Level 2): Potential Dam Failure Situation; Rapidly Developing:**

1. The Dam Owner or Operator should contact the State Dam Safety Office to report the situation and, if time permits, request technical staff to investigate the situation and recommend corrective actions.
2. The Dam Owner or Operator should contact the County Office of Emergency Management, and the State Dam Safety Office to inform them that the emergency action plan 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.
3. Provide updates to the County Office of Emergency Management and emergency services personnel to assist them in making timely decisions concerning the need for warnings, road closures, and evacuations.
4. If time permits, the Dam Owner, Operator, and/or his technical representative 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 STATE DAM SAFETY OFFICE; REFER TO THE EMERGENCY LEVEL TABLE FOR GUIDANCE IN DETERMINING THE APPROPRIATE EVENT LEVEL FOR THE NEW CONDITION AND RECOMMENDED ACTIONS.
5. Record all of the contacts that were made on the *Contact Checklist* (Appendix A-1).Record all information, observations, and actions taken on the *Event Log Form* (Appendix A-2). Note the time of changing conditions. Document the situation with photographs and video if possible.
6. If time permits, the following emergency remedial actions should be taken as appropriate.

**Emergency Remedial Actions**

**If time permits**, the following emergency remedial actions should be considered for Potential Failure 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 the State Dam Safety Office. See *Resources Available* (Appendix B-1) for sources of equipment and materials to assist with remedial actions.

#### Embankment Overtopping

1. If 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 principal spillway gate or low-level outlet works to lower the reservoir level as rapidly as possible to a level that stops or decreases the seepage to a non-erosive 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, including 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 field survey to determine if there has been any settlement and movement of the dam embankment, spillway and low level outlet works.
3. Drain reservoir if required.

**Imminent Failure Emergency (Level 3): Urgent; Dam Failure Appears to be Imminent or is in Progress:**

1. The Dam Owner or Operator shall immediately contact the County Office of Emergency Management and others shown on the notification flow chart.
2. The County Office of Emergency Management shall lead the efforts to carry out warnings, close roads, and evacuations of people at risk downstream from the dam (see Evacuation Map tab).
3. Emergency Management services personnel shall alert the general public and immediately evacuate at-risk people and close roads as necessary.
4. The Dam Owner or Operator shall maintain continuous communication and provide the County Office of Emergency Management with updates of the situation to assist him in making timely decisions concerning warnings and evacuations.
5. The Dam Owner or Operator should record all of the contacts that were made on the Contact Checklist (Appendix A-1). Record all information, observations, and actions taken on the Events Log Form (Appendix A-2). Note the time of changing conditions. Document the situation with photographs and video if possible.
6. 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 Dam Owner and Inspectors are responsible for informing the County Office of Emergency Management and Maryland Dam Safety that the emergency at the dam is over or the condition is stabilized. The Incident Commander or designated alternate is responsible for terminating EAP operations in consultation with qualified engineers and Maryland Dam Safety and relaying this decision to the Dam Owner and Inspectors. 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 the termination of any event that has not caused actual dam failure, the dam Operator’s engineer and/or State Dam Safety Official 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 County Director of Emergency Management or designated alternate will be advised to terminate EAP operations as described above.

The Dam Owner shall assure that the *Dam Safety Emergency Situation Report* (Appendix A-3) is completed to document the emergency event and all the actions taken. he report should include an after-action review and evaluation that includes the following:

* Events or conditions leading up to, during, and following the incident
* Significant actions taken
* Strengths and deficiencies experienced in the incident management process, staffing, and leadership
* Corrective actions identified and a planned course of action to implement recommendations

The Dam Owner shall distribute copies of the completed report to the State Dam Safety Office and his technical representative.

# Maintenance—EAP Review and Revision

**EAP annual review**

The Dam Owner or his representative will review and, if needed, update the EAP at least once each year. It is required to contact the MDE Dam Safety Division once a year to verify that the Plan has been reviewed and updated as necessary. 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 his representative 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 or his representative is responsible for updating the EAP document. When revisions occur, the Dam Owner will provide a complete revised document 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 will 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, conducted at the County Name DEP Office. Attendance should include the Dam Owner, dam inspectors, the owners engineer, MDE Dam Safety Division, the emergency management director, and 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 his representative 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 or his representative will prepare a written summary of the periodic test and revise the EAP, as necessary.

# Record of Holders of Control Copies of this EAP

The holders of the official copies of the EAP should add their initials and date next to their name shown below when they receive their copy of this EAP. Their initials signify that they have reviewed the EAP and that they concur with the tasks and responsibilities assigned to them and their organization.

|  |  |  |
| --- | --- | --- |
| **Copy Number** | **Organization** | **Person receiving copy** |
| 1 | Dam Owner Name  Address City, State, Zip | First Name Last Name |
| 2 | County Name DPW  Address City, State, Zip | First Name Last Name |
| 3 | County Name DEP  Address City, State, Zip | First Name Last Name |
| 4 | County Name Director of Emergency Management’s Department Address City, State, Zip | First Name Last Name |
| 5 | County Name Emergency Management Address City, State, Zip | First Name Last Name |
| 6 | County Name Police Department Address City, State, Zip | First Name Last Name |
| 7 | MDE Dam Safety Division 1800 Washington Boulevard Baltimore, Maryland 21230 | First Name Last Name |
| 8 | Other Address City, State, Zip | First Name Last Name |

# Record of Revisions and Updates Made to EAP

|  |  |  |  |
| --- | --- | --- | --- |
| **Revision Number** | **Date** | **Revisions made** | **By whom** |
| # | MM/DD/YY | Describe revisions made to the document. | First Name Last Name |

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

**Appendix A**

A–1 Contact Checklist

A–2 Unusual or Emergency Event Log Form

A–3 Dam Emergency Situation Report Form

A–4 Glossary of Terms

**Appendix B**

B–1 Resources Available

B–2 Location and Vicinity Maps

B–3 Watershed Project Map

B–4 Inundation Map

B–5 Residents/Businesses/Highways at Risk

B-6 Flood Summary Table

B-7 Residents/Business/Highways at Rick for High Flow Emergency

B–8 Plan View of Dam

B–9 Profile of Principal Spillway

B–10 Reservoir Elevation-Area-Volume and Spillway Capacity Data

B–11 National Inventory of Dams (NID) Data

# Appendix A–1

### Contact Checklist

Dam Name, MD Dam No. ###

Dam Location Date: MM/DD/YYYY

The following contacts should be made immediately after the emergency level is determined (see pages   
7–9 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* tab for critical contact information and *Emer. Services Contacts* tab for contact information for other possible emergency services.

Emergency Level 1 (see page 15) Person Time Contacted

Contacted Contacted by

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

\_\_\_ Dam Owner’s Engineer \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_ MD Dam Safety \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

Emergency Level 2 (see page 16) Person Time Contacted

Contacted Contacted by

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

\_\_\_\_ Dam Owner’s Engineer \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_ Emergency Management \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_ MD Dam Safety \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

Emergency Level 3 (see page 17) Person Time Contacted

Contacted Contacted by

\_\_\_\_ Emergency Management \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

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

\_\_\_\_ Dam Owner’s Engineer \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_ MD Dam Safety \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_

# Appendix A–2

**Unusual or Emergency Event Log**

(to be completed during the emergency)

Dam name: Dam Name, MD Dam No. ### County: County Name

When and how was the event detected? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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

General description of the emergency situation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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

**Actions and Event Progression**

|  |  |  |  |
| --- | --- | --- | --- |
| **Date** | **Time** | **Action/event progression** | **Taken by** |
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Report prepared by: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Appendix A–3

**Dam Emergency Situation Report**

(to be completed following the termination of the emergency)

Dam name: Dam Name, MD Dam No. ###

National Inventory of Dams (NID) No.: MD00###

Dam location: # miles (direction) of (nearest downstream town) County Name Stream/River Name

*(City) (County) (Stream/River)*

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

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

General description of emergency situation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Area(s) of dam affected: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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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: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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Other data and comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

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

# Appendix A–4 Glossary of Terms

**Abutment** 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.

**Acre-foot** 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.

**Berm** A nearly horizontal step (bench) in the upstream or downstream sloping face of the dam.

**Boil** 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.

**Breach** 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.

**Conduit** A closed channel (round pipe or rectangular box) that conveys water through, around, or under the dam.

**Control section** A usually level segment in the profile of an open channel spillway above which water in the reservoir discharges through the spillway.

**Cross section** 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.

**Dam** An artificial barrier generally constructed across a watercourse for the purpose of impounding or diverting water.

**Dam failure** The uncontrolled release of a dam’s impounded water.

**Dam Operator** The person(s) or unit(s) of government with responsibility for the operation and maintenance of dam.

**Drain, toe or foundation,** A water collection system of sand and gravel and typically pipes along the

**or blanket** downstream portion of the dam to collect seepage and convey it to a safe outlet.

**Drainage area (watershed)** The geographic area on which rainfall flows into the dam.

**Drawdown** 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.

**Emergency** A condition that develops unexpectedly, endangers the structural integrity of the dam and/or downstream human life and property, and requires immediate action.

**Emergency Action Plan** A formal document identifying potential emergency conditions that may

**(EAP)** 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.

**Evacuation map** 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.

**Filter** 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.

**Freeboard** Vertical distance between a stated water level in the reservoir and the top of dam.

**Gate, slide or sluice,** An operable, watertight valve to manage the discharge of water from the

**or regulating** dam.

**Groin** The area along the intersection of the face of a dam and the abutment.

**Hazard classification** A 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 misoperation of a dam.

**Height of dam** 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.

**Hydrograph, inflow or** A graphical representation of either the flow rate or flow depth at a specific

**outflow, or breach** point above or below the dam over time for a specific flood occurrence.

**Incident Commander** The highest predetermined official available at the scene of an emergency situation.

**Instrumentation** 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.

**Inundation area or map** The geographic area downstream of the dam that would be flooded by a breach of the dam or other large discharge.

**Notification** To immediately inform appropriate individuals, organizations, or agencies about a potentially emergency situation so they can initiate appropriate actions.

**Outlet works** An appurtenant structure that provides for controlled passage of normal

**(principal spillway)** water flows through the dam.

**Piping** The progressive destruction of an embankment or embankment foundation by internal erosion of the soil by seepage flows.

**Probable Maximum** The theoretically greatest precipitation or resulting flood that is

**Precipitation (PMP) or** meteorologically feasible for a given duration over a specific drainage area

**Flood (PMF)** at a particular geographical location.

**Reservoir** The body of water impounded or potentially impounded by the dam.

**Riprap** 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.

**Risk** A measure of the likelihood and severity of an adverse consequence.

**Seepage** The natural movement of water through the embankment, foundation, or abutments of the dam.

**Slide** The movement of a mass of earth down a slope on the embankment or abutment of the dam.

**Spillway (auxiliary** The appurtenant structure that provides the controlled conveyance of

**or emergency)** excess water through, over, or around the dam.

**Spillway capacity** The maximum discharge the spillway can safely convey with the reservoir at the maximum design elevation.

**Spillway crest** The lowest level at which reservoir water can flow into the spillway.

**Tailwater** The body of water immediately downstream of the embankment at a specific point in time.

**Toe of dam** The junction of the upstream or downstream face of an embankment with the ground surface.

**Top of dam (crest of dam)** The elevation of the uppermost surface of an embankment that can safely impound water behind the dam.

# Appendix B–1 Resources Available

Locally available equipment, labor, and materials:

Local DPW (or similar) has the following resources that can be utilized in the event of an emergency:

* Equipment 1
* Equipment 2
* Equipment 3
* Equipment 4
* Materials 1
* Materials 2
* Materials 3

Contact the Local DPW (or similar) —see *Emer. Services Contacts* tab.

Other locally available resources include:

|  |  |  |
| --- | --- | --- |
| **Heavy equipment service and rental** | **Sand and gravel supply** | **Ready-mix concrete supply** |
| Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX |
|  |  |  |
| Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX |
|  |  |  |
| **Pumps / Generators** | **Diving contractor** | **Sand bags** |
| Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX | Company Name Address City, State 410-555-XXXX |

# Appendix B–2 Location and Vicinity Maps

**(INSERT MAP, SIZE AS NECESSARY FOR LEGIBILITY)**

# Appendix B–3 Watershed Project Map

**(INSERT MAP, SIZE AS NECESSARY FOR LEGIBILITY)**

# Appendix B–4 Inundation Map

**(INSERT MAP, SIZE AS NECESSARY FOR LEGIBILITY)**

# Appendix B–5 Residents/Businesses/Highways at Risk

A major flood caused by a sudden breach of the dam is estimated to inundate ### homes, ### businesses, and ### highways. These homes and businesses (marked on the evacuation map) are located (Indicate area using direction, approx. distance, roadways and other features).

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **House/ business no.\*** | **Resident/business** | **Address** | **Phone no.** | **Distance downstream from dam (ft)** | **Travel time\*\* (hr)** | **Max water depth above first floor (ft)** |
| # | Resident Name(s) | Address, City, State | 410-555-XXXX | #### | ## | ## |
| B-# | Business Name | Address, City, State | 410-555-XXXX | #### | ## | ## |
| B-# | Business Name | Address, City, State | 410-555-XXXX | #### | ## | ## |
| B-# | Business Name | Address, City, State | 410-555-XXXX | #### | ## | ## |
| # | Resident Name(s) | Address, City, State | 410-555-XXXX | #### | ## | ## |
| # | Resident Name(s) | Address, City, State | 410-555-XXXX | #### | ## | ## |
| # | Resident Name(s) | Address, City, State | 410-555-XXXX | #### | ## | ## |
| # | Resident Name(s) | Address, City, State | 410-555-XXXX | #### | ## | ## |
|  | Highway Name |  |  | #### | ## | ## |
|  | Highway Name |  |  | #### | ## | ## |
|  | Highway Name |  |  | #### | ## | ## |

* See Appendix B–4.

\*\* 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: Company Name, Date

Hydraulic model used: TR–20 (routing); TR–60 (peak discharge); TR–66 (hydrograph)

Model assumptions:

* Breach type: (Full PMF, Half PMF, 100-year)
* Water surface elevation in reservoir prior to breach = #### (also indicate elevation in relation to top of dam, e.g., “top of dam”)
* Total volume of breach hydrograph = #### acre-ft
* Height of water at time of breach = #### ft
* Peak breach discharge = #### ft3/s

Downstream area defined by field surveys consisting of ## cross sections and ## bridge openings**Appendix B–6  
Flood Summary Table**

**PMF and Sunny Day Failures**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Cross**  **Section No.** | **Location** | **Flood Depth**  **Sunny Day PMF**  **(ft)** | | | **Elevation (ngvd)**  **Sunny Day PMF**  **(ngvd)** | | **Flood Travel Time**  **Sunny Day PMF**  **(hrs)** | | **Distance from Dam (mi)** |
|  |  |  |  |  | |  |  |  |  |
|  |  |  |  |  | |  |  |  |  |
|  |  |  |  |  | |  |  |  |  |
|  |  |  |  |  | |  |  |  |  |
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|  |  |  |  |  | |  |  |  |  |
|  |  |  |  |  | |  |  |  |  |

The flood depth, elevations, and travel times values listed in this table are based on a normal pool failure “sunny day” and a probable maximum flood (PMF) failure. An actual failure may vary from these values depending on the storm duration & amount, and the actual dam breach geometry.

# Appendix B–7

**High Flow Emergency Level**

**Residents/Businesses/Highways at Risk**

If the auxiliary spillway flows at depths shown below, the following infrastructure may be inundated:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **House/ business**  **no.\*** | **Resident/ business** | **Address** | **Phone**  **no.** | **Aux. Spillway Flow depth**  **(ft.)** | **Capacity**  **(cfs)** |
| 1 | Fred and Ethel James | 10300 132nd Street | 555–XXXX | 1.5 | 1,800 |
| B-4 | Bill’s Coffee Shop | 1455 Sugar Street | 555–XXXX | 2.0 | 2,300 |
|  | OK Highway 44 |  |  | 1.0 | 1,000 |

\* See appendix B–5

# Appendix B–8 Plan View of Dam

**(INSERT MAP, SIZE AS NECESSARY FOR LEGIBILITY)**

# Appendix B–9 Profile of Principal Spillway

**(INSERT MAP, SIZE AS NECESSARY FOR LEGIBILITY)**

# Appendix B–10 Reservoir Elevation-area-volume and Spillway Capacity Data

testDam Name, MD Dam No. ###

|  |  |  |  |
| --- | --- | --- | --- |
| **Elevation (ft)** | **Reservoir Surface (acres)** | **Reservoir Storage (acre\*ft)** | **Spillway Discharge**  **(ft3/s)** |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| Principal Spillway Crest (El. ###) | | | |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| Emergency Spillway Crest (El. ###) | | | |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |
| ## | ## | ## | ## |

# Appendix B–11 National Inventory of Dams (NID) Data

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

State: **\_\_\_\_\_\_\_\_**

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

Longitude:– **\_\_\_\_\_\_\_\_**

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

Geodetic location: **\_\_\_\_\_\_\_\_**

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

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

Nearest town: **\_\_\_\_\_\_\_\_**

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

Operator: **\_\_\_\_\_\_\_\_**

Year constructed: **\_\_\_\_\_\_\_\_**

Year rehabilitated: **\_\_\_\_\_\_\_\_**

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

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

Dam volume: **\_\_\_\_\_ yd3**

Max. discharge: **\_\_\_\_** **ft3/s**

Max. storage: **\_\_\_\_\_acre-ft.**

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

Surface area: **\_\_\_ acre**

Drainage area: **\_\_\_ mi2**

Inspection frequency: **1 yr.**

State regulated?: **Yes**

State reg. agency: **\_\_\_\_\_\_\_\_**

Federal funding: **USDA NRCS**

Federal design: **USDA NRCS**

Federal constructed: **USDA NRCS**

Program authority: **Flood prevention**

Watershed No.: **\_\_\_\_\_**

Watershed name: **\_\_\_\_\_\_\_\_**

Service life: **\_\_\_ yr.**

O&M insp. resp.: **\_\_\_\_\_\_\_\_**

O&M insp. current?: **\_\_\_\_\_**

Population at risk: **\_\_**

Design hazard potential classification: **\_\_\_\_**

Current hazard potential classification: **\_\_\_\_\_**

Hazard potential classification year: **\_\_\_\_**

Sediment storage: **\_\_\_\_ acre-ft.**

Flood storage: **\_\_\_\_\_ acre-ft.**

Surcharge storage: **\_\_\_\_ acre-ft.**

Other storage: **\_\_\_\_ acre-ft.**

Principal spillway type: **Concrete pipe**

Principal spillway conduit diameter:**\_\_\_ in.**

Auxiliary spillway type: **Vegetated earth**

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