



Water Resources Program
Dam Safety Office- Simplified Emergency Action Plan

Project Name: _____

DSO File Number: _____

Location: _____
(City/Town, County, and Stream)

Prepared by: _____

Owner: _____

Issue Date: _____

Revised Date: _____

INTRODUCTION

The purpose of this Emergency Action Plan form is to reduce the risk of injury or loss of life and to minimize property damage during an unusual event or emergency. The EAP defines responsibilities and provides procedures designed to:

- Identify conditions that may endanger the dam.
- Begin remedial actions to prevent or minimize the downstream impacts of a dam failure.
- Notify local emergency personnel and effectively communicate conditions.
- Warn downstream residents of impending or actual failure of the dam.
- Conclude the response to the unusual or emergency event.

Also available is the comprehensive *Emergency Action Plan template* and *Guidelines for Developing Dam Emergency Action Plans*. To request a copy of either publication, please call (360)407-6872 or e-mail us at WRPuplications@ecy.wa.gov

Please complete the section below:

BASIC EAP DATA

Potentially Impacted Area:

Please describe the property(s) downstream of the dam: (agricultural, residential, industrial, critical wildlife habitat, etc.) _____.

Additional information on impacted areas if available: _____

Located on: _____ Creek/River

Downstream Flood Path: _____ Creek/River to _____

Creek/River _____ to _____ River, etc.

Description of the Dam:

Official Dam Name: _____

State I.D. Number: _____

Dam Owner and/or Operator: _____

Owner and/or Operator Contact Numbers: (_____)_____-_____,(_____)_____-_____

E-Mail Address: _____

Section ____ Township ____ Range _____ W.M. County: _____

Type of Dam: (earthfill, concrete, rockfill, or:) _____

Dam Height: _____ Crest Length: _____

Crest Width: _____

Downstream Hazard Classification: _____

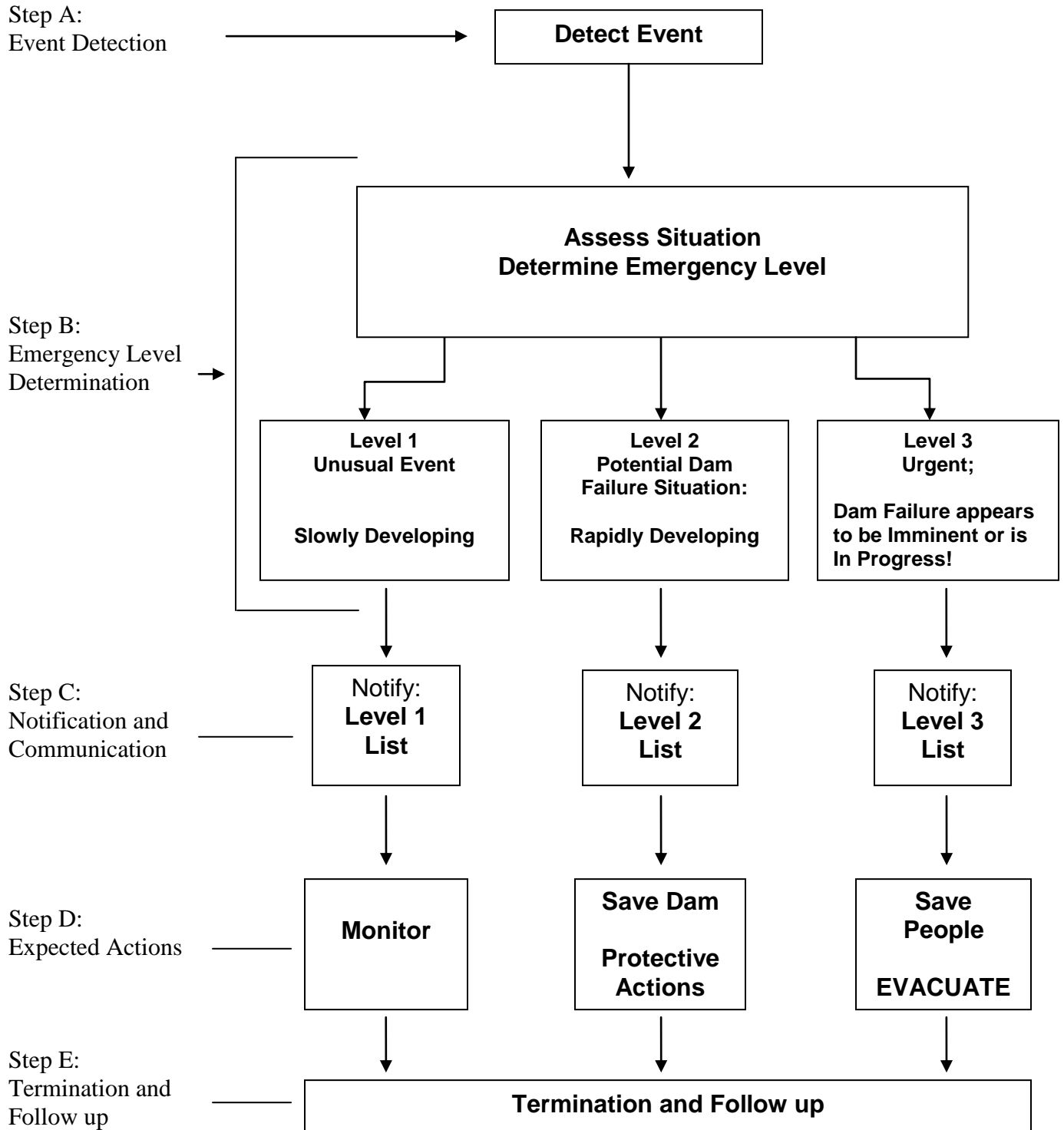
Number of Homes in the Dam break floodplain: _____

Complete the contact list for persons downstream affected by flood waters in Step C.

Directions to the Dam: _____

LOCATION MAP

Emergency Action Plan Overview



STEP A: *Event Detection*

Unusual or emergency events can be detected by:

- Observations made at or near the dam.
- Earthquakes felt or reported at or near the dam.
- Other condition that can cause an unusual or emergency event at the dam. For example, forecasts of a severe weather event, a flash flood, upstream dam failures or releases.

STEP B: *Emergency Level Determination*

DETERMINING THE EMERGENCY LEVEL

After an unusual or emergency event is detected or reported, the dam owner or representative is responsible for classifying the event into one of the following three emergency levels, use the guidance chart and examples of emergency situation beginning on the next page.

It is important to become familiar with the different emergency levels and situations before an event occurs.

Emergency Level 1 - Unusual event, slowly developing

This event is not normal but has not yet threatened the operation or structural integrity of the dam. This event could affect the structural integrity of the dam if left unchecked.

Emergency Level 2 - Potential dam failure, rapidly developing

This event may eventually lead to dam failure and potential flooding downstream, but there is not an immediate threat of dam failure. This emergency level also applies when uncontrolled flow through the dam's spillway has or is likely to result in flooding of downstream areas, but is not yet affecting buildings or roads, or posing a significant risk to healthy, safety, or welfare.

Emergency Level 3 - Urgent; dam failure appears imminent or is in progress

This is an urgent event, where a dam failure is occurring or is clearly about to occur and cannot be prevented. Flash flooding will occur downstream of the dam. The amount of flooding and resulting damage will be dependent upon several factors, such as the water level in the reservoir and the time of year. If the breach occurs during the dry season when the water level in the reservoir level is low, the escaped water will flood a significantly smaller area than when the breach occurs at the time the dam's reservoir is full. If a breach occurs when the dam's reservoir is full, the entire area shown on the inundation map will be flooded.

This event level is also applicable when flow through the dam's spillway is flooding buildings or roads. The dam owner **will contact (911)** and the **responsible Emergency Services** to evacuate people at risk and close roads in the flood path if necessary.

Guidance for Determining the Emergency Level

Event	Situation	Emergency Level*
Spillways	Principal spillway severely blocked with debris or structurally damaged	1
	Principal spillway leaking with muddy flows	1
	Principal spillway blocked with debris and pool is rapidly rising	2
Flooding	National Weather Service issues a flood warning for the area	1
	The reservoir elevation reaches the predetermined notification trigger elevation of █ inches below dam crest	2
	The reservoir elevation reaches the predetermined notification trigger elevation of █ inches below dam crest	3
	Spillway flow is flooding roads and people downstream	3
	Flood flows are overtopping the dam	3
Seepage	New seepage areas in or near the dam	1
	Boils observed downstream of dam	1
	Boils observed downstream of dam with cloudy discharge	2
	New seepage areas with cloudy discharge or increasing flow rate	2
	Cloudy flow and one or more of the following (with constant reservoir level): accelerating rate of flow, expanding flow at exit point, or buildup of soils.	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 1/2 -inch wide and greater than two feet deep, without seepage	1
	Cracks in the embankment with seepage emerging	2
Embankment Movement	Visual movement/slippage of the embankment slope	1
	Sudden or rapidly proceeding slides of the embankment slopes	2
Instruments	Instrumentation readings beyond predetermined values	1
Earthquake	Measurable earthquake felt or reported 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 the dam or appurtenances 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 the dam or appurtenances that has resulted in seepage flow	2
	Damage to the dam or appurtenances that has resulted in uncontrolled water release	3

* Emergency level 1: Non-emergency, unusual event, slowly developing.

Emergency level 2: Potential dam failure situation, rapidly developing.

Emergency level 3: Urgent; dam failure appears to be imminent or is in progress.

Examples of Emergency Situations

The following are examples of conditions that may occur at a dam that usually constitute an emergency situation.

- Dam aging or design and construction oversights may cause a dam to fail.
- Extreme weather events that may exceed design conditions can cause significant flow through the emergency spillway or can overtop the embankment.
- Accidental or intentional damage to the dam may also result in an emergency situation.

We have grouped the examples below to identify the more likely emergency level conditions. They are for guidance only, and not all emergency conditions are listed. We urge the dam owner to use conservative judgment in determining whether a condition at the dam constitutes an emergency.

Emergency Spillway Flows

Emergency Level 2 - Potential dam failure; rapidly developing:

- Significant erosion or head cutting of the spillway is occurring, but a breach of the spillway crest that would result in an uncontrolled release from the reservoir does not seem imminent.
- Flow through the emergency spillway is likely to cause flooding that threatens harm to any person, home, or road downstream from the dam.

Emergency Level 3 – Urgent; dam failure is imminent or in progress:

- Significant erosion or head cutting of the spillway is occurring at a rapid rate and a breach of the control section appears imminent.
- Flow through the emergency spillway is causing flooding that threatens harm to any person, home, or road downstream from the dam.

Embankment Overtopping

Emergency Level 2 - Potential dam failure; rapidly developing:

- The reservoir level has reached the top of the dam and is projected to continue to rise.
- Flow is occurring over the embankment, but it is not eroding the embankment slope, and the reservoir is expected to continue to recede.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

- Flow is occurring over the embankment and is causing erosion damage to the embankment slope.
- The reservoir level has exceeded the top of the dam and is expected to continue to rise.

Seepage and Sinkholes

Emergency Level 2 - Potential dam failure; rapidly developing:

- Cloudy seepage or soil deposits are observed at seepage exit points or from internal drain outlet pipes.
- 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.
- Significant new or enlarging sinkhole(s) on or near the dam.
- Reservoir level is falling without apparent cause.
- The following known dam defects are or soon will be inundated by a rise in the reservoir:
 - a. Sinkhole(s) located on the upstream slope, crest, abutment, and/or foundation of the dam; or
 - b. Transverse cracks extending through the dam, abutments, or foundation.

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

- Rapid increase in cloudy seepage or soil deposits at seepage exit points, to the extent that failure appears imminent or is in progress.
- Rapid increase in volume of downstream seepage, to the extent that failure appears imminent or is in progress.
- 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.
- Whirlpools or other evidence exists indicating that the reservoir is draining rapidly through the dam or foundation.
- Rapid enlargement of sinkhole(s) is forming on the dam or abutments, to the extent that failure appears imminent or is in progress.
- Rapid increase in flow through crack(s) which is eroding materials, to the extent that failure appears imminent or is in progress.

Embankment Movement and Cracking

Emergency Level 2 - Potential dam failure; rapidly developing:

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

Emergency Level 3 - Urgent; dam failure is imminent or in progress:

- Sudden or rapid progression of slides, settlement, or cracking of the embankment crests, slopes, abutments, and/or foundation, where breaching of the dam appears imminent or is in progress.

Other Problems

In case of other problems occurring that might pose a threat to the dam safety, contact the Dam Safety Office and explain the situation as well as possible.

Step C: Notification and Communication

The Emergency Action Plan overview (above) and the Notification flowchart are designed to give guidance during an unusual event or emergency.

Emergency Level 1: Developing failure or unusual situation

If there is a **slowly developing failure** or **unusual situation**, where failure is not imminent, but could occur if no action is taken, dam tending personnel should:

- Notify Local Emergency Services (____) _____ of the potential problem and keep them advised of the situation.
- Contact the Washington State Department of Ecology, Dam Safety Office (DSO) at (360) 407-6208 for an evaluation of the dam.
- During these contacts, find out if there are any immediate actions that can be taken to reduce the risk of failure.
- If necessary, implement preventative actions described under *Step D* of this plan.
- **If situation deteriorates, be prepared to implement Notification Flowchart!**

Emergency Levels 2 & 3: Potential dam failure or failure in progress

If there is a **potential dam failure** (Emergency Level 2) or a **dam failure** is imminent or in progress (Emergency Level 3) implement the notification Flowchart.

NOTIFICATION FLOWCHART

When developing your EAP, contact your **local police** or **sheriff** (use the non-emergency phone number) and the **State Division of Emergency Management** at (800)562-6108 or by e-mail: www.emd.wa.gov/myn/myn_contact_info.shtml to determine **who** is responsible for notifying persons in the flood path if an evacuation is necessary.

Individual responsibilities

Determine who is responsible for individual duties and tasks. It is important that no one person becomes overwhelmed during an unusual event or an emergency. The following list indicates who is responsible for each predetermined duty.

	Name	Phone	Responsibility
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

County/City Emergency Services or Sheriff

	Name	Position	Phone
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Add pages as needed

Department of Ecology Dam Safety Office

	Name	Position	Address	Phone
1.	Dam Safety Office		PO Box 47600 Olympia WA 98504	(360) 407-6208 office (360) 971-6347 beeper
2.	Jerald LaVassar	Geotechnical Engineer	PO Box 47600 Olympia WA 98504	(360) 407-6625 direct (360) 456-1370 home

State Division of Emergency Management

Duty Officer (24 Hours) 1-800-258-5990

If a failure is imminent or in progress, downstream evacuation of the floodplain must be started immediately in accordance with the following:

1. Notify persons immediately downstream from the dam of the failure;
2. Contact Local County or City Emergency Services Dept. or Sheriff
3. Contact State Dam Safety Office and begin any recommended procedures;
4. Take preventive actions described on **Step D** of this plan;

Persons Downstream First Affected by Flood Waters

List in order of proximity to dam

Name	Phone	Address	No. of Residents
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____

Add pages as needed

Step D: *Expected Actions*

PREVENTATIVE ACTIONS TO BE TAKEN

The following actions may help to prevent or delay, or a dam failure after an emergency is first discovered. **These actions should only be performed under the direction of the Dam Safety Office, or other qualified professional engineers.**

Overtopping by Flood Waters

- Open outlet to its maximum safe capacity.
- Place sandbags along the dam crest to increase freeboard and force more water through the spillway and outlet.
- Provide erosion-resistant protection to the downstream slope by placing plastic sheets or other materials over eroding areas.
- Divert flood waters around the reservoir basin if possible.

Reduction in Freeboard and/or Loss of Dam Crest Width

- Place additional rip rap or sandbags in damaged areas to prevent further embankment erosion.
- Lower the water level to an elevation below the damaged area.
- Restore freeboard with sandbags or earth and rock fill.
- Continue close inspection of the damaged area until the storm is over.

Slide on the Upstream or Downstream Slope of the Embankment

- Lower the water level at a rate, and to an elevation, that is considered safe given the slide condition. If the outlet is damaged or blocked, pumping, siphoning, or a controlled breach may be required.
- Restore lost freeboard by placing sandbags or fill in the top of the slide.
- Stabilize slides on the downstream slope by weighting the toe area with additional soil, rock, or gravel.

Erosional Seepage or Leakage (Piping) through the Embankment, Foundation, or Abutments

- Plug the flow with whatever material is available (hay bales, bentonite, or plastic sheeting if the entrance to the leak is in the reservoir).
- Lower the water level until the flow decreases to a non-erosive velocity or until it stops.
- Place a blanket filter (a protective sand and gravel filter) over the exit area to hold materials in place.
- Continue lowering the water level until the reservoir reaches a safe elevation.
- Continue operating at a reduced level until repairs are complete.

Failure of an Appurtenant Structure such as an Outlet or Spillway

- Implement temporary measures to protect the damaged structure, such as closing an outlet or providing temporary protection for a damaged spillway.
- Employ experienced, professional divers, if necessary, to assess the problem and possibly implement repair.
- Lower the water level to a safe elevation. If the outlet is inoperable, pumping, siphoning, or a controlled breach may be required.

Mass Movement of the Dam on its Foundation (Spreading or Mass Sliding Failure)

- Immediately lower the water level until excessive movement stops.
- Continue lowering the water level until a safe level is reached.
- Continue operation at a reduced level until repairs are complete.

Excessive Seepage and High Level Saturation of the Embankment

- Lower the water to a safe level.
- Continue frequent monitoring for signs of slides, cracking, or concentrated seepage.
- Continue operations at a reduced level until repairs are complete.

Spillway Back cutting Threatening Reservoir Evacuation

- Reduce the flow over the spillway by fully opening the main outlet.
- Provide temporary protection at the point of erosion by placing sandbags, rip rap materials, or plastic sheets weighted with sandbags.
- When inflow subsides, lower the reservoir to a safe level.
- Continue operating at a lower water level in order to minimize spillway flow.

Excessive Settlement of the Embankment

- Lower the water level by releasing it through the outlet or by pumping, or siphoning.
- If necessary, restore freeboard, preferably by placing sandbags.
- Lower water to a safe level.
- Continue operating at a reduced level until repairs can be made.

SUPPLIES AND RESOURCES

In an emergency situation, equipment and supplies might be needed on short notice, such as sandbags, rip rap, fill materials, equipment, and laborers. In the table below, list supplies and how to access them.

Item	Contact	Location
Earthmoving Equipment	_____	_____
Sand and Gravel	_____	_____
Sandbags	_____	_____
Pumps	_____	_____
Pipe	_____	_____
Laborers	_____	_____
Other	_____	_____

Step E: Termination and Follow up

Termination responsibilities for level 1 unusual event

If you have activated the EAP, you must take actions to conclude the EAP once the event is over and you have followed all the needed procedures.

- *Contact Ecology's Dam Safety office and your dam engineer* to further investigate the situation and recommend corrective actions if necessary.
- Document the situation with photographs and/or video, note times and conditions.
- Inspect the full length of the upstream slope, crest, downstream slope, and downstream toe of the dam. Check the reservoir area, abutments, and downstream channel of the dam.

Termination responsibilities for level 2 or 3 emergencies

Your Local Emergency Manager is responsible for terminating the EAP operations for a Level 2 or Level 3 emergency, and relaying this decision to the dam owner.

- The Washington State Dam Safety Engineer must assure the dam is inspected to determine if any hazardous conditions exist.
- If it is determined that hazardous conditions no longer exist, the Washington State Dam Safety Supervisor will advise the Local Emergency Manager to terminate EAP operations.
- The person who made the original calls must inform each person contacted that the emergency has ended.

APPROVAL OF THE PLANS

The undersigned persons have reviewed this Emergency Action Plan and concur with the proposed notification procedures.

Dam Owner: _____

Dam Operator: _____

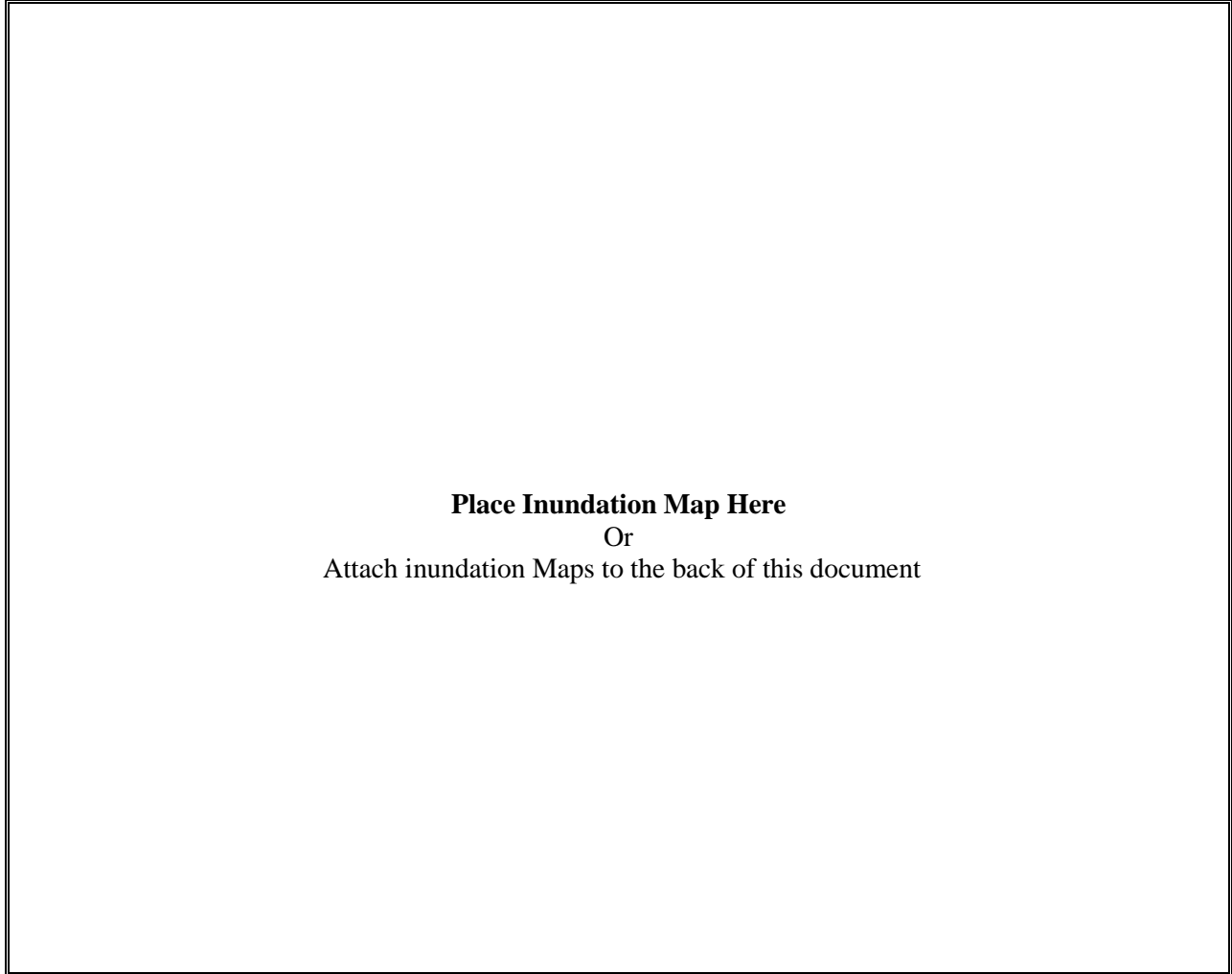
Local Emergency Services: _____

Dam Safety Office: _____

Other: _____

INUNDATION MAPS

_____ homes could be affected by a major flood caused by a sudden breach of the dam. These homes are marked on the following inundation map. Flood waters would reach the first home approximately _____ minutes after the dam failure.



If you need this document in a format for the visually impaired, call Water Resources Program at 360-407-6872. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.