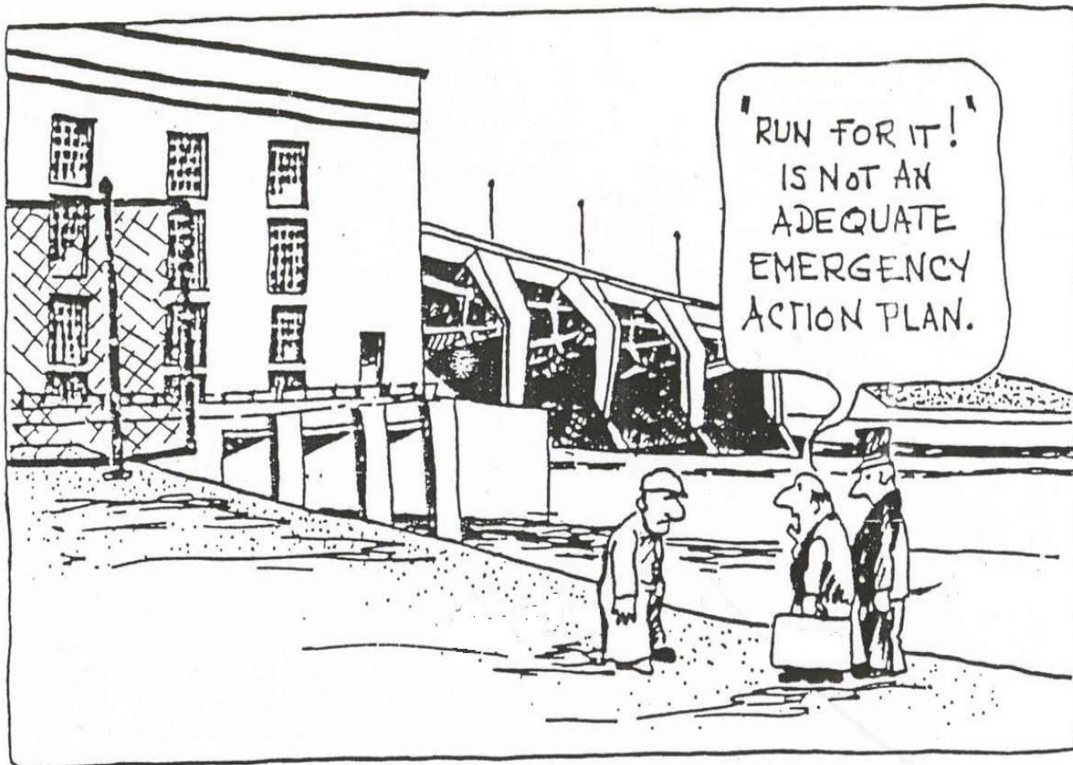


EMERGENCY ACTION PLAN (EAP) GUIDEBOOK



Prepared by the
Wisconsin Department of Natural Resources
Dam Safety and Floodplain Management



Updated June 2019

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This guidance was created by the Department of Natural Resources for the benefit and convenience of dam owners. Because of differences in the location, size, construction and downstream development of each dam, the dam owner may wish to consult his or her own risk manager and/or engineering consultant if modifications are considered necessary to the attached template.

Photographs in this document were provided by DNR files photos.

This publication was supported by funding from the Federal Emergency Management Agency as part of the National Dam Safety Program Grant. The contents do not necessarily reflect the views and policies of the Federal Government.

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General Information

There are over 3,500 dams in the State of Wisconsin. Many of these dams have the potential to cause the loss of life and considerable property damage if they were to fail. Although a majority of dam owners are confident in the both structural integrity of their dam and operating procedures in place, large precipitation events such as those that have occurred in the last decade have shown that even the best maintained and operated dams can experience emergencies and threaten downstream properties.

The best method of avoiding an emergency response is proper operation, maintenance and inspection. An Emergency Action Plan (EAP) is not a replacement for proper maintenance or remedial construction. However, a carefully developed and implemented EAP is an important step that a dam owner can take to protect their investment and downstream lives and property.

The EAP is a formal document prepared by the dam owner and operator, or their consultant, that identifies potential emergency conditions at a dam and prescribes procedures to be followed to reduce the likelihood of the loss of life and minimize property damage. A well written EAP identifies the parties involved in responding to a dam emergency, specifies each party's responsibilities and tasks, and outlines the appropriate lines of communication for different levels of response (based on the severity of the emergency). Developing an effective EAP requires communication and coordination between various groups including local elected officials, emergency managers, local law enforcement, state and federal regulators, and, in some cases, the public.

Requirements for Emergency Action Plans

Under Chapter NR 333, Wisconsin Administrative Code, Dam Design and Construction, owners are required to develop an EAP for each large dam that they own. Owners of small dams may develop an EAP if they see a need, but an EAP is not required.

Each EAP must be reflect site specific conditions, incorporate requirements of the owner, agency or organization that operates or regulates the use of the dam, and match the structure of the emergency response organizations that will ultimately use the EAP.

The purpose of an EAP is to provide the owner and operator of a dam a clear plan of action when an emergency arises. A dam emergency is identified as any condition which:

- develops unexpectedly;
- endangers the structural integrity of the dam; and
- could result in failure of the dam, thereby resulting in downstream flooding and requiring immediate action.

Ch. NR 333.07(3)(c), Wisconsin Administrative Code lists the required components of an EAP and states:

(c) An adequate emergency action plan shall be prepared for the area downstream from the dam in consultation with the local unit of government and concurred in by the division of emergency government. An adequate emergency action plan shall include, but is not limited to, the following information:

- 1. A notification flow chart identifying involved agencies, other dam owners both upstream and downstream and their phone numbers.*
- 2. Emergency operation procedures.*
- 3. An inundation map of the hydraulic shadow on a scale of 1" = 2000' or less that extends downstream to an elevation within one foot of the dam nonexistent profile.*
- 4. Procedures for notification of all property owners affected by a dam failure and a list of their names, addresses and phone numbers.*

Guidebook Explained

The purpose of the EAP Guidebook (Guidebook) is to provide a dam owner with a standard process for developing an EAP. The planning process is broken down into a series of steps. Each step includes an explanation of the documents, why they are required, and a checklist of action items.

It is recommended that the person writing the EAP review the entire Guidebook and EAP template before starting. A dam owner may have much of the needed information already on hand and only need to transfer the information to the appropriate forms. In other cases, the dam owner may have to locate information before drafting or updating their EAP.

An electronic version of the Guidebook and EAP template (.pdf format) can be found at <http://dnr.wi.gov/topic/dams/documentsEAP.html>.

To request a copy of an editable EAP template (.docx format), please contact DNRDamSafety@wisconsin.gov or the Department of Natural Resources (DNR) Water Management Engineer (<https://dnr.wi.gov/topic/dams/regionalcontacts.html>). The EAP template contains highlighted text which must be deleted or updated to apply to a specific dam.

Using Your Emergency Action Plan

In many cases a dam owner can limit the need to activate an EAP through proper maintenance or remedial construction, however, emergencies can and do arise. The following suggestions may make an EAP easier to use:

- Print pages on one side only for ease in copying or replacing pages
- Place the EAP in a three-ring binder for durable field use
- Laminate important pages or place them in plastic sleeves
- Use different colored paper for important pages or different sections
- Use divider tabs to identify different sections and to quickly access them during an emergency
- Use headers and footers to identify each sheet with dam name in case sheets get separated.

Steps to Develop an EAP

Even though all dams are unique, the approach to develop an EAP is similar for all. While at first glance it might appear that preparation of an EAP is a time-consuming task, this Guide has been prepared to streamline the process and help you through each step. See the recommended steps below.

- Step 1.** Locate existing documents
- Step 2.** Compile information about the dam
- Step 3.** Compile information about the site
- Step 4.** Identify information for notification lists and flowcharts
- Step 5.** Assemble draft version of EAP
- Step 6.** Contact local emergency manager
- Step 7.** Distribute draft version of EAP for review
- Step 8.** Obtain Concurrence page signatures
- Step 9.** Finalize and distribute EAP
- Step 10.** Update EAP

Step 1. Locate existing documents

Documents associated with your dam may be in various places and take some detective work to track down. Or, you may already have a file folder or drawer with all information associated with your dam!

You may not have or be able to locate all items. If you need assistance finding information, the following people may be able to help:

- DNR Dam Database
- Engineering consultant
- County Zoning Administrator
- County Land Conservation offices
- Current or past Town Chair or Town Supervisors
- DNR Water Management Engineer

Action Items

Locate and obtain:

- Current version of EAP
- DNR Dam Database
 - <https://dnr.wi.gov/topic/Dams/damSearch.html>
 - Search for your dam
 - Explore the tabs at the top of the page; specifically, the “Report” tab
- Dam Failure Analysis (DFA)
- Past dam inspection reports
- Plan set
- Any historical information or correspondence
- DNR Water Management Engineer contact information
 - <https://dnr.wi.gov/topic/dams/regionalcontacts.html>
- Editable EAP template
 - Contact the DNR Water Management Engineer responsible for the county in which the dam is located to obtain most recent editable version of template
 - Review this document to understand the type of information needed and to identify similarities and differences between the current version of your EAP and the template

Step 2. Compile information about the dam

REFER TO: EAP Template Section IV, Section V, and Appendix C

Pretend you are standing on the top of your dam looking around. Use the documents obtained in Step 1, along with your institutional knowledge, to think about details specific to the dam.

Description of Dam

Most, if not all, of the information required to describe the dam can be found on the DNR Dam Database report (<https://dnr.wi.gov/topic/Dams/damSearch.html>). The DNR Surface Water Data Viewer (<https://dnr.wi.gov/topic/SurfaceWater/swdv/>) is a useful tool to see the dams located upstream and downstream, determine the land use upstream and downstream of the dam, and to measure distances.

The DNR uses two unique numbers to identify each dam in the state, the field file (FF) number and a dam key sequence number (DKSN). The first two numbers of the FF represent the county number, whereas the DKSN has no specific meaning.

Dam Failure Analyses

A Dam Failure Analysis (DFA) is a technical document consisting of tabular and visual data that can be used to identify water surface elevations and properties at risk during a failure event. DFAs are required by NR 333, Wisconsin Administrative Code for large dams and consist of four main pieces of information:

1. Report – describes dam structure, hydrology, hydraulic model setup/inputs, and assumptions
2. Data tables – summary of hydraulic model output that includes the water surface elevation, floodway top width, flowrate, cross section flow area, and mean velocity for each cross section
3. Water surface profiles – a profile view of how the water surface elevation changes along the river channel
4. Maps – an outline of the area inundated by water and the cross section location; typically the background of the map is an aerial image with street names and sometimes includes parcel and jurisdictional boundaries

There are 3 scenarios evaluated as part of the DFA and included in the report:

1. Hydraulic shadow – commonly called the “dam failure” scenario; assumes that the dam is in existence and fails during a 100-year storm event
2. Dam in place, no failure – assumes that the dam exists and passes a 100-year storm event
3. Dam nonexistent – assumes the dam has been removed during a 100-year storm event

There are data, a water surface profile, and a map associated with each scenario. Sometimes information for all scenarios is presented in one table, figure, and map. The hydraulic shadow map and associated information is the scenario used in the EAP.

The DFA is not public information and for security reasons should not be included in the EAP in its entirety. Only the data tables, profiles, and maps for the hydraulic shadow should be included in the EAP.

An effective EAP identifies everyone who would be affected by a dam emergency or involved in responding to a dam emergency. The hydraulic shadow map should be used to identify downstream structures (e.g., residential, business, park shelters, etc.) and infrastructure (e.g., roads, bridges, culverts, storage tanks, substations, gas/sewer/water lines, etc.) that need to be listed as critical facilities. In some cases, it may be difficult to determine if a structure is in or out of the hydraulic shadow or there might be structures that are close to the inundation boundary; if in doubt, it is better to err on the side of caution and include them in the critical facilities list. If roads are impacted, alternate routes need to be determined in order to access the dam during an emergency. Emergency management response and the personnel involved will require more coordination if the hydraulic shadow crosses county boundaries. If this is the case, it would need to be discussed at the meeting with the local emergency manager.

Emergency Conditions at Your Dam

The situations or incidents that could trigger an emergency condition vary in type and complexity and from dam to dam. Depending on the configuration, an emergency can be as simple as higher than normal water levels in the pool at one dam, to sinkholes forming in the embankment or a gate failing at another dam. A dam owner and operator need to be aware of the threats to their dam and be prepared to respond appropriately. If you are unsure of what the situations, incidents or threats are for your dam, contact an engineering consultant to help you determine the events that could affect the dam's condition, trigger an emergency at the dam and to determine if the levels of severity are appropriate. Suggested triggering situations and accompanying severity levels are provided in the EAP template.

Action Items

- Complete **Description of Dam** table
 - DNR Dam Database information
 - DNR Surface Water Data Viewer
- Complete **Upstream/Downstream Dam** table (if applicable)
- Locate Hydraulic Shadow Map in DFA
 - Review DFA report
 - Look at map and identify critical downstream facilities
 - Look at map and identify if hydraulic shadow crosses community or county boundaries
- Review and modify **emergency level** descriptors
 - Add bullet points of criteria that specifically apply to your dam, if any
- Review and modify **Guidance for Determining the Emergency Level** table
 - Delete rows that do not apply to your dam
- Review **Level of Emergency Determination Chart** for understanding

Note: **Red text** refers to sections, tables or charts in the EAP template

Step 3. Compile information about the site

REFER TO: EAP Template Section I, Section VI, and Appendix E

Pretend you are a bird (or drone) flying around the sky looking down on your dam and the surrounding areas. Think about details associated with where the dam is located, its influence on the landscape, and how you would get resources to the dam in an emergency.

Location Map

In addition to identifying the dam location, it is also important to identify how to physically get to the dam. Some dams are in remote areas where one cannot drive directly to the dam or, in extreme cases, can only access by boat. In addition, the map should show how to get to the site in the event of road closures; identify roads or bridges that are commonly closed due to high water or other obstructions to traffic.

The location map should identify public access points (i.e., boat ramps) so that notices can be posted during an emergency, or in the event a drawdown is required, to inform users of the impoundment of potentially unsafe or abnormal conditions. If access points are unknown or need to be confirmed, use the DNR boat and shore fishing access map viewer (<https://dnr.wi.gov/topic/lands/boataccess/>).

If there is no cell phone service at the dam site, show the location (e.g., road intersection, town/village/city, landmark, etc.) that someone would have to drive to get service.

Use the DNR Surface Water Data Viewer (<https://dnr.wi.gov/topic/SurfaceWater/swdv/>) to zoom into the location of your dam. From there, you can turn on different map layers to explore land use upstream and downstream of your dam.

Resources

The types of resources needed to respond to a dam emergency depends on the size and configuration of the dam as well as the type of emergency. For example, a small dam with a shallow pool is unlikely to need a diver for a structural evaluation during an emergency. However, all dams likely need access to heavy equipment along with sand and gravel. It is recommended that consideration be given to all possible dam emergencies to develop a comprehensive list of resources.

If some smaller items, such as pumps or siphons, are stored at or near the dam, still include them in the Available Resources Chart and describe where they are located so they can be easily accessed. If a key is needed to reach or operate the dam, make sure to identify where the key is or who has access to it.

Action Items

- Make a location map
 - Use DNR Surface Water Data Viewer, Google Maps, Microsoft PowerPoint, ArcGIS, or some combination thereof
 - Identify public access points, location of water control structure, location of all embankments, access roads, and alternative routes
 - Note whether there are any locked gates/fences/control structures and where to find key

- Identify resources and their sources that may be needed during an emergency
 - Add or remove resources from the **Available Resources Chart**
 - Insert information into **Available Resources Chart**
 - If there are both primary and secondary sources for certain resources, include both
 - Consider making a map showing the location of the resources relative to the dam site

Note: **Red text** refers to charts in the EAP template

Step 4. Identify information for notification lists and flowcharts

REFER TO: EAP Template Section V and Appendix B

Now that you have specific details about both the dam and site, think about who needs this information. There are those who need to know because they might be physically impacted, those who should know because they are likely to be contacted by others, those who will need to know to assist during an emergency, and then those who would like to know.

In this step, you as the dam owner do your best to identify and locate the contact information and create the notification flowcharts. Compiling this information will prepare you to meet with the local emergency management official responsible for the community surrounding the dam (see Step 6).

This section of the EAP should also note if the dam site does not have cell phone reception, or specifically which cell phone providers do/do not have service. If there is no cell phone service at the dam, try to identify the location (e.g., road intersection, town/village/city, landmark, etc.) that someone would have to drive to get service in order to provide the condition or status of the dam to others.

Notification Lists

The notification lists contain contact information for all persons and entities involved in the emergency response process as well as those affected by an emergency. Contact information should include both office and cell phone numbers. If an agency is included as a contact, the list should include a primary contact and an alternate contact, if available.

The list of jurisdictions, agencies, groups and individuals who are involved will vary from dam to dam. However, certain agencies and groups will typically be involved for any dam:

- Dispatch center (911)
- Law enforcement
- Emergency management officials
- State Emergency Hotline and DNR Duty Officer
- Elected officials
- Representatives/owners of critical facilities

Much public contact information can be found on county, town, village, or city websites. The local county/town/village/city clerk can assist to verify information and provide upcoming election dates so you will be aware when the contact names may change. Many counties have mapping tools to identify parcels and owners (addresses, but not phone numbers) as well.

In the case where phone numbers are needed for private individuals with impacted land/structures, you can stop by their property when they are there or write a letter

notifying them that their property is in the hydraulic shadow and ask for contact numbers to be used during an emergency response. A note should be made on the Notification List of any individual who might require special assistance or businesses with hazardous materials. If the notification list contains private information you may consider adding a disclaimer to the notification list to state: "This contact information is not to be released to the public and is not to be used for any purpose other than a dam emergency."

It is important to remember that dam emergencies have upstream impacts in addition to downstream impacts. If the impoundment created by the dam has a Lake Association or Lake District include a representative and contact them to discuss their involvement during an emergency. If you don't know who to contact, many Lake Associations and Lake Districts have websites or social media sites.

Note: Several of the contacts identified in this step will be the same individuals who need to sign the Concurrence page and receive a copy of the final EAP.

Notification Flowcharts

The purpose of notification flowcharts are to show the order of who is to be called and who will make the call. The first call in any emergency is always to the local law enforcement agency. Flowchart boxes should be arranged in the order of who is to be contacted. The notification flowchart should be shrunk or expanded to fit the level of detail to match that needed for each specific dam.

Action Items

- Determine name and contact information for local emergency manager
 - Look on county website or <https://dma.wi.gov/DMA/wem/response/county-directors>
- Develop list of contacts at public agencies
 - Find contact names and phone numbers from county/town/village/city websites
 - Include multiple communities if hydraulic shadow crosses community or county boundaries
 - Identify both primary and secondary contacts
- Develop list of contacts upstream of dam
 - Lake Association/District contact information
 - Contact for access points to impoundment
- Develop list of contacts downstream of dam
 - Refer to hydraulic shadow map
 - Use county mapping website to obtain private parcel information
- Fill in contact information on **Notification List**
- Fill in contact information on **Notification Flowchart** and reorder boxes as needed

Step 5. Assemble draft version of EAP

EAP Template all Sections

The information gathered and developed in the previous steps can be inserted into the EAP template. There will be some information needed that was not addressed specifically in the steps above (e.g., photo of dam, where EAP is stored, etc.) – now is the time to insert that information as well.

EAP Template

Any of the content in the EAP template can be edited. There may be sections of the EAP template that do not apply to your situation that will need to be deleted. The blank spaces and **highlighted text** must be updated with information to specific to your dam. The template document also contains **instructions or suggested text** for you to consider or update. The template contains instructions how to insert a photo and to automatically update the table of contents.

Concurrence Page

The purpose of the Concurrence page is to ensure that everyone who has a defined responsibility in the EAP agrees to accept the responsibility. Mandatory signers of the Concurrence page are the dam owner, dam operator (if different from owner), local law enforcement, local emergency management, and the DNR State Dam Safety Engineer. The owner needs to determine if other people like elected officials, representatives/owners of critical infrastructure, neighboring communities should sign the Concurrence page.

Action Items

- Decide who will need to sign the **Concurrence page**
 - Note that the people you identify to sign may change as a result of your meeting with the local emergency manager
- Update EAP template

Note: **Red text** refers to section in the EAP template

Step 6. Contact local emergency manager

EAP Template Section II, Section V, Appendix B and Appendix C

In most cases, and in order to be effective, the EAP must be developed in conjunction with the local community and emergency management agency. Emergency management officials are an excellent resource for identifying anyone who could be affected by an emergency and provide insight regarding how this incident fits into their overall Incident Command System (ICS). The amount of input from the emergency manager typically depends on the complexity of your dam. For example, a high hazard dam in an urban area will require much more coordination than a low hazard dam where there is no downstream development.

Consider how your interactions with emergency management might be different if the dam failure is an isolated event versus part of a large precipitation event with widespread damage and whether that is important information to include in the EAP. Emergency managers have experience in responding to all types of emergencies and can provide information on what has worked in other emergency situations, the availability of resources, or who should be included in the EAP.

Action Items

- Contact local emergency manager
 - Determine whether you can discuss EAP on phone or if a meeting is needed
 - Review the emergency notification flow chart with the emergency management staff person
- Discuss the following items with the emergency manager
 - Impacts associated with hydraulic shadow map
 - Response coordination if hydraulic shadow crosses county boundaries
 - Levels identified on **Guidance for Determining the Emergency Level** table
 - Names included in **Notification List**
 - Order shown on **Notification Flowchart**
 - Confirm names on **Concurrence page**
 - Communication plan and equipment
 - How dams fit into the county All Hazards Emergency Response/Operations Plan, make sure there are no conflicts between the EAP and the county plan
 - How often you need to meet with them
- Update EAP to incorporate changes suggested by emergency manager

Note: **Red text** refers to sections, tables or charts in the EAP template

Step 7. Distribute draft version of EAP for review

An effective EAP is one which is written in coordination with other emergency response plans and has been reviewed and commented on by all those involved in responding to a dam emergency. The purpose of the review is to ensure that the proposed plan will be successful during an emergency.

The draft EAP should be clearly marked as a draft document by using a watermark or by writing the word “DRAFT” on each page. Print or email the draft EAP and distribute for review and comment.

While the DNR Water Management Engineer is typically not involved in the writing of the draft EAP, it is recommended that the draft EAP be sent to them first before sending it to others for review. The DNR Water Management Engineer will work with the DNR State Dam Safety Engineer, so a separate review by the DNR State Dam Safety Engineer is not needed. After comments are received from the DNR Water Management Engineer and incorporated into the EAP, the document can be sent to the other reviewers. If major changes are recommended by other reviewers, you may consider sending the draft document to DNR Water Management Engineer again before obtaining signatures on the Concurrence page.

Comments on the draft document can be obtained by either providing a copy of the draft EAP to those involved or by organizing a meeting with all involved parties. A coordination meeting may also need to be held with business owners and residents if any would be affected by a dam emergency.

Action Items

- Develop list of document reviewers
 - Typically, this list corresponds to the people who will sign the **Concurrence page**
 - Do not include the DNR State Dam Safety Engineer (the DNR Water Management Engineer will include their comments)
- Send draft EAP to DNR Water Management Engineer
 - Determine whether you can review the EAP on the phone or if a meeting is needed
- Incorporate DNR comments and send draft to other reviewers
 - Consider whether document will be sent individually and the order in which it will be sent, or a meeting would be more effective
- Incorporate changes suggested by reviewers into EAP

Note: **Red text** refers to section in the EAP template

Step 8. Obtain Concurrence page signatures

EAP Template Section II

The final version of the EAP is reached once all comments and recommended changes have been received, agreed upon, and incorporated into the draft EAP. The EAP must then be sent to signers for their concurrence and approving signature.

The owner needs to obtain all signatures except for the DNR State Dam Safety Engineer. All signatures must be on the same page.

Once all Concurrence page signatures are received (less the DNR State Dam Safety Engineer) submit the entire document, including the signed Concurrence page(s), to the DNR Water Management Engineer. Emailed, electronic copies are preferred, but paper copies sent through the mail are also accepted. The DNR Water Management Engineer will route to the DNR State Dam Safety Engineer for their signature. The dam owner will be sent an approval letter along with a copy of the Concurrence page with the State Dam Safety Engineer signature.

Action Items

- Obtain signatures on **Concurrence page** (except for State Dam Safety Engineer)
- Send final version of EAP to DNR Water Management Engineer
- File approval letter and completed Concurrence page from DNR Water Management Engineer upon receipt

Note: **Red text** refers to section in the EAP template

Step 9. Finalize and distribute EAP

EAP Template Appendix F and Appendix G

Copies of the approved EAP must be sent to all holders of the EAP. A list EAP holders is included in an appendix of the EAP. This list should be updated and maintained as needed.

A copy of the EAP must also be kept by dam owner and operator. If the dam has a structure on site, it is recommended that a copy of the EAP be posted in an easily accessible location.

Action Items

- Distribute approved document to EAP holders
- Post copy of EAP at dam, if possible

Step 10. Update EAP

EAP Template Appendix F and Appendix G

The EAP planning process does not end once the EAP is written, approved and distributed to involved participants.

Every time an EAP is activated because of a dam emergency, it should be reviewed after the emergency is over to determine what went right and what could be improved. The after action review is an opportunity to fine tune the response process. Any changes to the EAP must be approved by the signers of the document (i.e., those signing the Concurrence page), approved by the DNR Water Management Engineer, and redistributed to EAP holders.

Because a dam emergency should be rare, taking an opportunity to review an EAP needs to be intentional. The dam owner should set up a process to review the EAP annually. The purpose of an annual review is to ensure that all contact information in the EAP is correct. Simultaneously, the dam owner can verify that those contacts are familiar with the EAP and their responsibilities. Minor changes such as updated contact information may not require updated signatures on the Concurrence page, unless one of the signers changes or is new. However, changes must be distributed to all EAP holders (listed in an EAP Appendix).

Along with an annual review of the EAP, it is recommended that dam owners and operators meet with the local emergency manager every five (5) years to discuss changes to the All Hazards Emergency Response/Operations Plan that may pertain to their dam. Dam owners and operators should also work with local emergency management to determine what opportunities exist to conduct or participate in dam related EAP exercises.

Action Items

- Check information the following sections of the EAP
 - Verify people listed for the positions on the **Concurrence page** and in List of EAP Holders
 - Verify information in **Notification List and Flowcharts**
 - Verify information in **Available Resources Chart**
 - Verify that information in **Dam Description** and **Hydraulic Shadow** sections are correct
 - Complete **EAP Update Chart**
- Send updated EAP to DNR Water Management Engineer for review
 - Sometimes DNR staff have changed and the dam owner may not know
- Obtain Concurrence page signatures, if needed
- Send to DNR Water Management Engineer for approval
- Distribute updated document to EAP holders
- Post copy of EAP at dam, if possible

Note: **Red text** refers to sections in the EAP template